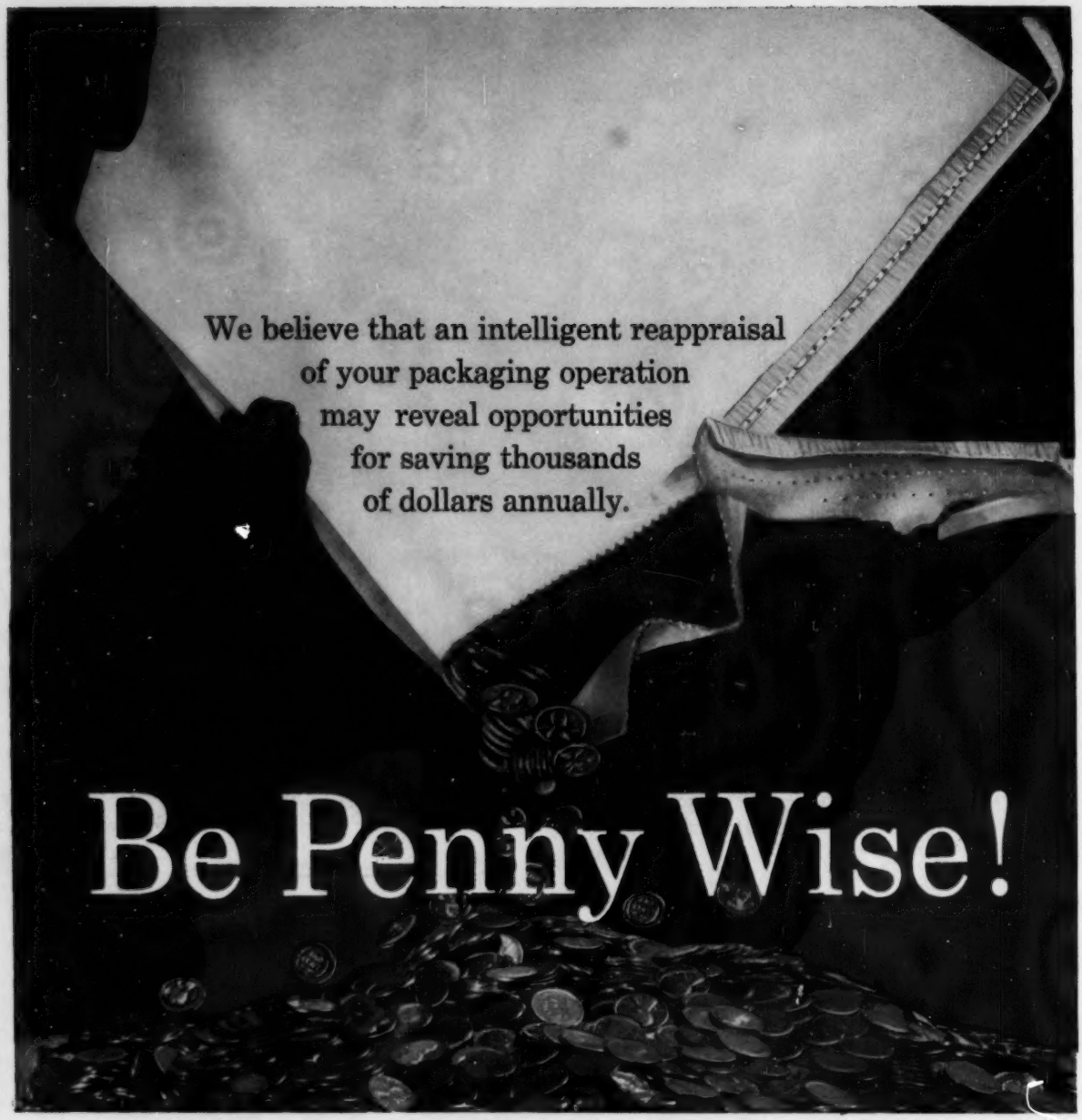
MAY, 1958

Commercial Fertilizer
and PLANT FOOD INDUSTRY

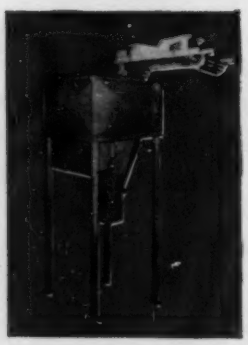
# HOW TO MAKE MORE MONEY FROM MIXED FERTILIZERS

SEE PAGE 19

Advertisement of NITROGEN DIVISION, ALLIED CHEMICAL




# IN BUYING MULTIWALL BAGS NO SAVING IS TOO SMALL TO IGNORE!



**THE KRAFTPACKER** Open Mouth Bag Filling Machine, for free-flowing material, automatically saves pennies, too, through higher production and greater accuracy. Requires a lower investment and maintenance cost than any other automatic machine of its type in use today!

## KRAFT BAG CORPORATION

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Daily News Bldg., Chicago 6, Ill.

Integrated mills at St. Marys, Georgia and Gilman, Vermont

*Exclusive Sales Agents for Kraftpacker*

*Show me how to save on my multiwall bag packaging.*

Gilman PAPER CO.
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• Container Corp. Div.
• The Gilbreath Corp.
• Kraft Bag Corp.

COMPANY.....

ADDRESS.....

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PRODUCT MFD.....

NAME.....

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# ..and quality you can *talk* about!

**YOU CAN BAG NUTRONITE FOR LAWNS**

Bag Nutronite to fill out your line of lawn and garden fertilizers. Golf courses use large quantities, too. For information on this profitable market for an all organic fertilizer write Smith-Rowland Co., Norfolk, Va.

Nutronite (formerly Smirow) adds to the selling power of your mixed fertilizers. Plainly visible Nutronite assures your customers of added growth and profits . . . brings back satisfied customers year after year.

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***Let us figure the cost of Nutronite delivered to your plant.***

SMITH NUTRONITE ROWLAND

**SMITH-ROWLAND CO.**

P. O. Box 1219, Norfolk 1, Va.

A DIVISION OF SMITH DOUGLASS COMPANY, INCORPORATED

Vol. 96 No. 5 · *Established 1910* · May, 1958

# Commercial Fertilizer and PLANT FOOD INDUSTRY

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## Contents



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## Commenting Freely

*by* BRUCE MORAN

**Far be it from Commercial Fertilizer Magazine to mount a soap-box. We have been an intimate part of the fertilizer industry since 1910. So we know that our people manage to do pretty well for themselves, come what may. But our little brother, the Japanese, is doing a thing that strikes us as pretty smart.**

**Financed jointly by the Japanese Government and the Japan Chemical Fertilizer Export Association, they are setting up industry branch offices in southeast Asia. Agronomists will go around, visiting the various areas and working up fertilizer business. This is a new phase of Japan's marketing of fertilizer. Last year's Japanese exports in a 6-month period ran 139% ahead of the same period in 1956.**

**Things are different in Japan than they are here, of course—but the key word in the paragraph above is "industry." It is a completely cooperative movement. It is selling tonnage. And that, as we have learned in the last 48 years to understand things in the fertilizer business, is the big idea.**

# THE MAN WITH THE MULTIWALL PLAN

**UNION PACKAGING SPECIALIST BOB BUCK**

## lowers customer's bag costs $35,000 annually

A little weight reduction can go a long way in trimming Multiwall costs. Union Packaging Specialist Bob Buck demonstrated just how far during a study of one company's bagging operation.

The company had been using a baler bag of 160# total basis weight. Union's analysis proved that a 70/70 bag would be equally effective. The 20# reduction resulted in a savings of $35,000 a year.

This economy came through Union's 5-Star Packaging Efficiency Plan. Among the other improvements were: (1) A new, revised specifications manual which simplifies and streamlines inventory control. (2) Standardization of all bag printing. This assures delivery of completely uniform print copy from the firm's various suppliers.

**Union Multiwall Recommendations are based on this 5-Star Packaging Efficiency Plan**

- DESIGN
- EQUIPMENT
- CONSTRUCTION
- SPECIFICATION CONTROL
- PLANT SURVEY

Union's plan is producing thousands of dollars worth of savings for Multiwall users, large and small. It might point the way to a greater return on your packaging investment. Write for details.

Better Multiwall performance through better planning

union camp

UNION'S PACKAGE ENGINEERING DEPARTMENT will study your Multiwall bagging methods and equipment and make appropriate recommendations, regardless of the brand of Multiwalls you are now using.

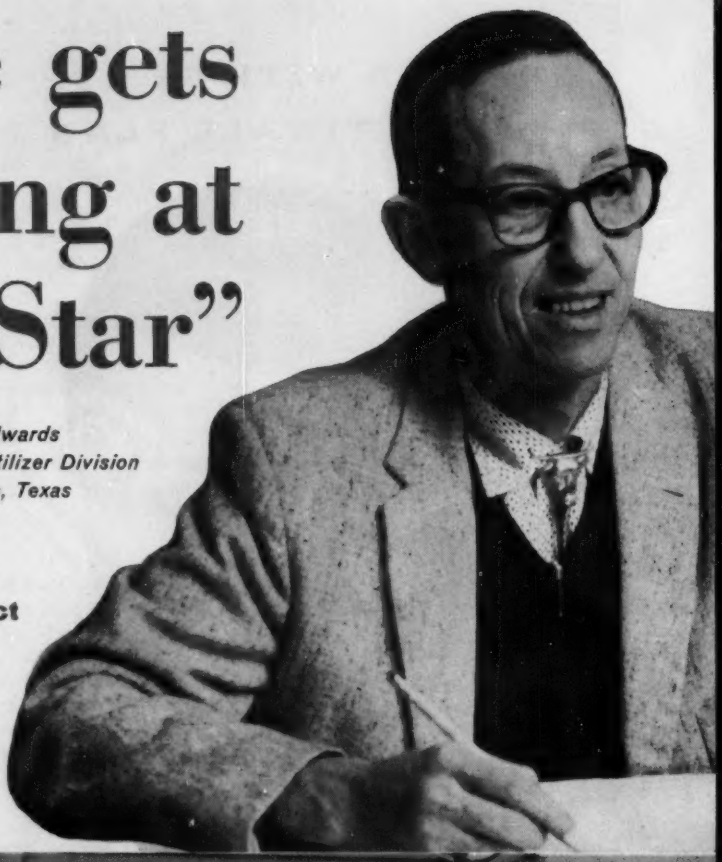
**UNION MULTIWALL BAGS**

UNION BAG-CAMP PAPER CORPORATION

233 BROADWAY, NEW YORK 7, N. Y.

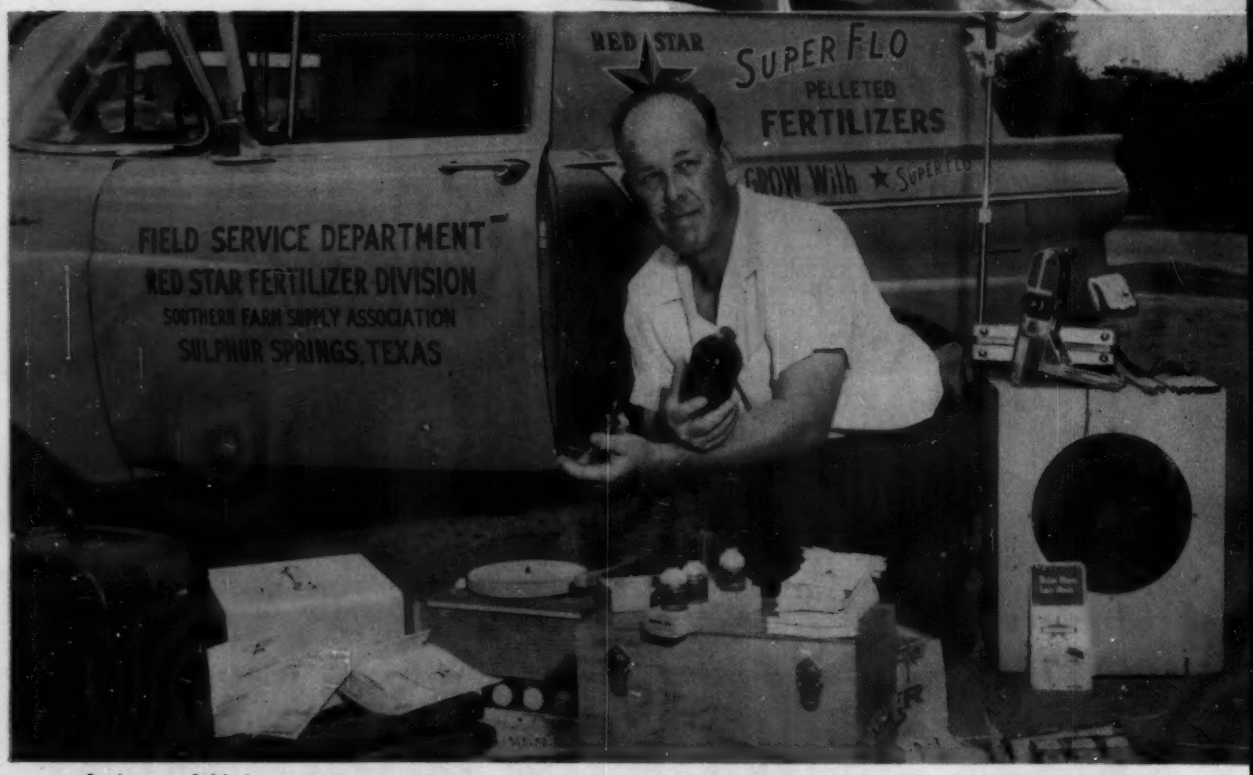
# "Service gets top billing at Red Star"

*says Archie Edwards*
*Manager, Red Star Fertilizer Division*
*Sulphur Springs, Texas*



**"And service is a mighty big reason we contract International's Triple"**

In supervising Red Star activities in Texas and four surrounding states, Manager Archie Edwards backs his decisions with more than 14 years of industry experience.




**Setting up field demonstrations** and helping dealers arrange meetings are common activities for Dale Campbell, field service director at Red Star. Complete merchandising service includes educational material on fertilizer usage, films, printed brochures and hand-out material as well as soil and tissue testing equipment. Red Star's 5-state sales area keeps Campbell and "Super-Flo" truck busy year-round.

"An action-planned program of customer service put us on the road to success here at Red Star," says Archie Edwards, manager of Red Star Fertilizer Division.

Take for example, the flashy yellow "Super-Flo" service truck — a welcome and familiar sight to Red Star dealers. The truck is loaded with educational, display and merchandising material . . . all designed to help dealers boost sales of "Super-Flo" fertilizers.

Red Star history dates to 1948, when the Sulphur Springs plant in northeastern Texas was purchased. The plant operates as the fertilizer division of Southern Farm Supply Association.

The same idea of top-quality product backed by top-flight service is one of the reasons Red Star uses International's Triple Super. Prompt delivery keeps peak season production schedules humming . . . uniform high analysis and good physical condition eliminate troublesome formulation problems.

You can benefit from International's superior quality triple and service tailored to fit your needs. Contact your International sales representative now for additional information.

**"Prettiest pelleted product anywhere,"** says Plant Superintendent John Souter, checking pellets at the cooler. Uniform, dust-free pellets are ideal for application by airplane.

**Granulation foreman Collis Gowen** checks reading on one of four belt gravimetric feeders that accurately weigh and control flow of all dry fertilizer materials.

**Covered loading dock** and expansion belts let Red Star workers load trailers direct from baggers — rain or shine. Belts are reversible to move goods into storage area.

**All mixed goods** are bagged under the "Super-Flo" label in both 50- and 80-lb. bags. In addition, the Red Star line includes other basic materials and specialty products.

**INTERNATIONAL MINERALS** International MINERALS CHEMICALS **& CHEMICAL CORPORATION**

**PHOSPHATE CHEMICALS DIVISION . . . . . 20 N. WACKER DRIVE, CHICAGO 6, ILL.**

# JUST AROUND THE CORNER *by Vernon Mount*

SLOW FIGURES have a tendency to defer recognition that recovery is in progress, just as slow figures delayed recognition of the recession. This is a problem that Government should be asked to work on. With modern equipment the tabulation and checking of data should not be delayed so long. And with a bit more budget the figures might well be printed and put into circulation much sooner.

PIPELINES are beginning to empty, and people can hold out against things they think they need only so long. And savings are burning holes in many pockets. Recovery in terms of major industrial investment must take longer. Many industries are overbuilt. Others figure to risk scarcity, rather than stick out corporate necks.

FEAR seems to be more in the minds of politicians than of the people, and there are likely to be some red faces in the halls of Congress in the not too distant future. Yet, there are millions of unemployed. And that is real and earnest.

PLAN for big things. They are just ahead; just around the corner.

Yours faithfully,

Vernon Mount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ANHYDROUS AMMONIA

AMMO-NITE® AMMONIUM NITRATE FERTILIZER — 33.5% NITROGEN

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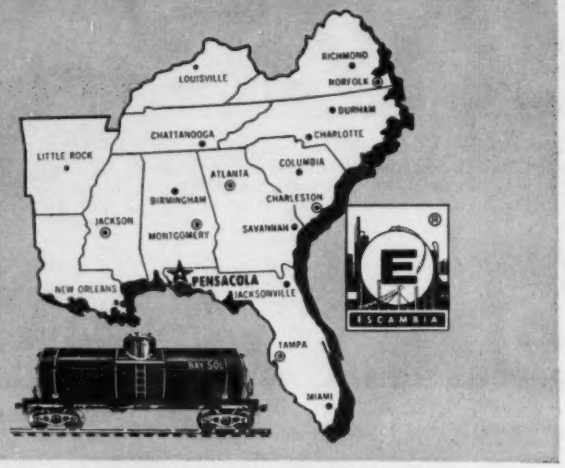

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High Porosity
High Water Soluble $P_2O_5$
Balanced Moisture
Free Acid
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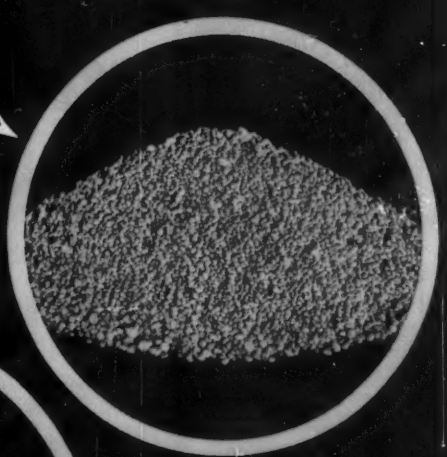

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Uniform Particle Size
Guaranteed 46% A.P.A.
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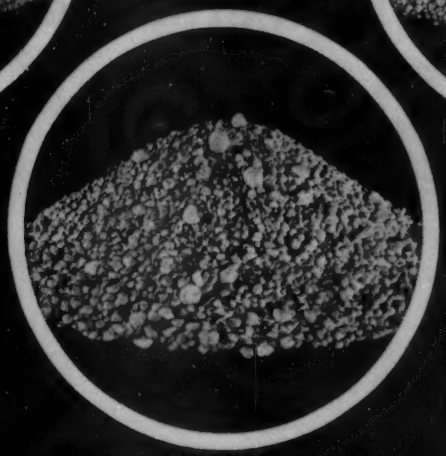

**COARSE**
Honeycomb Structure
High Water Soluble $P_2O_5$
Controlled Screen Size

Rigid Quality Control assures you of highest quality ROP, COARSE or GRANULAR TRIPLE SUPERPHOSPHATE.

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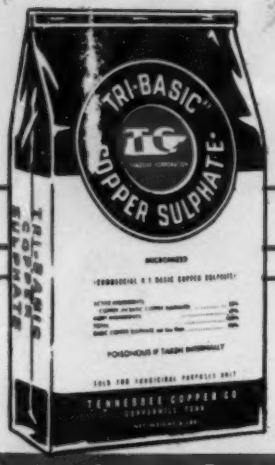
# TRI-BASIC COPPER




## The Versatile Fungicide

Longer Protection

Easy to Apply

Economical

Upgrades Quality of Fruits & Vegetables

Longer Shelf Life

Corrects Copper Deficiencies

Effective Control

Always Dependable

Compatible

Plentiful Supply

You get so many more advantages with Copper fungicides—used as a spray or dust on practically all truck crops in the control of persistent fungus diseases—Tri-Basic provides control of citrus and grape diseases, also on many decidious fruits—Tri-Basic has excellent adherence qualities and protects longer—lower disease control cost—greater yield of top quality produce.

**Is there another Fungicide offering these advantages?**

## TRI-BASIC COPPER SULFATE

**Quality Controlled from Mine to Finished Product**

*For further information please make requests on your company's letterhead.*

TENNESSEE TC CORPORATION

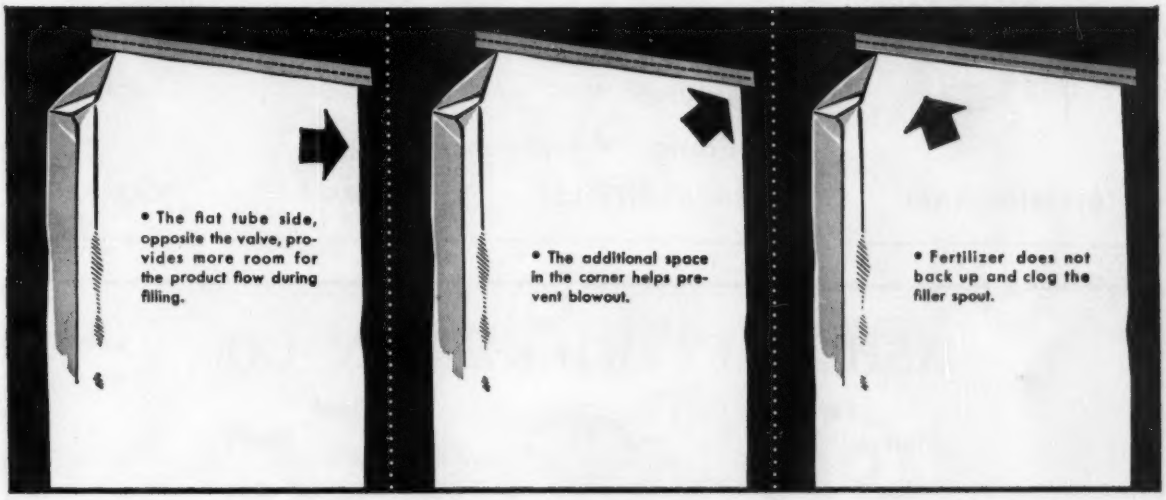
TENNESSEE CORPORATION

617-629 Grant Building, Atlanta, Ga.

# ANOTHER BEMIS MULTIWALL FIRST...
# ANOTHER IMPORTANT BONUS FOR YOU...

# Bemis Single-Gusset Sewn-Valve Multiwalls

**The new Bemis Single-Gusset Sewn-Valve Multiwall will improve your packing performance, *because***



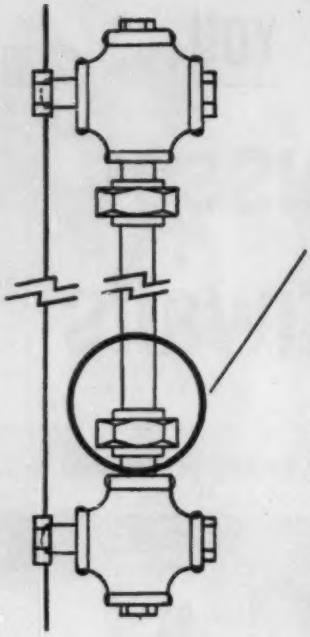

And there is a good chance this new Bemis Multiwall will cost you less, too. The additional usable space created by the flat tube corner often permits the use of a shorter bag, which would save you money. Your Bemis Man will check this possibility with you.

## Bemis Single-Gusset Multiwalls Stack Perfectly, Too

You can palletize Bemis Single-Gusset Multiwalls easily and firmly . . . and pile them three pallet loads high, if you wish. They square up well. In fact, you have to look rather closely at stacked bags in the warehouse to determine whether they are single-gusset or two-gusset types.

Bemis

**General Offices—408 Pine Street, St. Louis 2 • Sales Offices in Principal Cities**



## TULL designed to save you money
## NITROGEN SOLUTION SYSTEM
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Simple, easy to clean, inexpensive

The combination of a Tullco modified union and rubber bulb gasket guarantees a leak-proof connection.

We have the entire system in stock—buy as a complete unit or in part.

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INDUSTRIAL AND AGRICULTURAL
CHEMICALS


with TRONA'S*
new, specially-sized
granular

# POTASH

Quality fertilizer granulation begins with **Trona**'s all-new, specially-sized granular muriate of potash. The carefully regulated and controlled screen size results in reduced segregation and uniformity of finished product. Whatever your mixing method—batch or ammoniation, **Trona**'s new **granular** assures a quality fertilizer uniform in particle size.

TRONA **American Potash & Chemical Corporation**

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*New York Office:* 99 Park Avenue, New York 16, New York
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# High Grade Muriate of Potash...

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**First commercial runs with Cyanamid's new Triple Superphosphate indicate:**

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**2.** Even at rates over 5%, no uncomfortable ammonia fumes were evolved under optimum conditions.

**3.** The ability of TREBO-PHOS to ammoniate at high rates means manufacturers may choose from a wide range of nitrogen carriers.

**4.** Early indications are that the physical condition of TREBO-PHOS makes possible *complete* and *uniform* absorption of ammonia. A well conditioned mixed fertilizer which is dry and drillable should be the result.

WRITE, WIRE OR PHONE FOR FULL INFORMATION. OUR REPRESENTATIVE WILL BE GLAD TO CALL. NO OBLIGATION ON YOUR PART.

*TRADE MARK

CYANAMID

American Cyanamid Company, Phosphates Department
30 Rockefeller Plaza, New York 20, New York

# CHELATION AND *Fertilizer Solutions*

*by* E. J. HAERTL

*The Dow Chemical Company*

The developments in the field of coordinate chemistry during recent years have shed much light on the behavior of atoms and molecules in complex organic compounds. Not the least important of these compounds are the so-called metal complexes. Many of these metal complexes or coordinate compounds have been recognized or synthesized by the organic chemist and their behavior in certain systems has been responsible for many important reactions so vital to industry, medicine and agriculture. Some of the most significant metal complexes associated with plant and animal metabolism exist in the form of what are now called chelates. This term infers that the compound contains one or more chelate rings consisting of five or six atoms, one of the atoms in the ring being a metal. Thus, it is possible for a single metallic ion, dependent upon its so-called coordination number, to become a part of one to six or more chelate rings in the complex molecule. A metal held in such a manner loses its identity and becomes an integral part of the molecule. The number of chelate rings associated with the metal usually determines the stability of the metal chelate. The molecule supplying the atoms for the formation of chelation rings is termed the chelating agent. Thus, a water soluble chelating agent that can chelate metallic ions is called a sequestering agent since it actually hides the presence of the metals by forming their soluble chelates. This sequestering action of certain chelating agents is of the utmost importance particularly in the nutrition of plants.

The intensive cultivation of crops, as practiced by modern agriculture, results in an excessive reduction in the natural fertility of arable land. This has resulted in a steady increase in the use of fertilizer materials in an attempt to maintain a high degree of productivity. The extensive programs carried out by Agricultural Experiment Stations all over the world has contributed much to our knowledge about soil fertility and the importance of the proper use of nitrogen, phosphorus and potassium. In more recent years, the importance of other elements such as calcium, magnesium, sulfur, iron, zinc, manganese, copper, molybdenum and boron has become well established. The manner in which the living plant extracts these elements from the soil is still largely a mystery since most of them exist in the soil in amounts far in excess of that required by the living plant. It is a well established fact that soil organic matter contributes most of the heavy metals, such as iron, zinc, manganese and copper, to the growing plant and in virgin soils the nitrogen, phosphorus and potash as well. Many natural chelating agents exist in soil organic mater and the evidence indicates that their sequestering action is responsible for transportation of metals through the soil and possible absorption and translocation in the living plant. These natural chelating agents, as such, can be derived from decomposing organic matter, soil microorganisms or from the organic acids excreted by the living roots of plants. As soil organic matter, or humus, is depleted by cultivation, the living plant must depend upon its own root excretions to obtain the essential metallic elements.

### Synthetic vs Natural Chelates

Recent experimental work in many parts of the country has definitely established the fact that certain forms of metal chelate compounds can serve as a source of the metal in the nutrition of many plants. These metal chelates are products of the chemical industry and are strictly in the nature of synthetic compounds. With the increasing knowledge of coordination chemistry, it is possible for modern chemists to synthesize an organic molecule, with atoms placed in such a manner, that stable chelate rings can be produced. Consequently, such chelating agents as Versene*, (tetrasodium salt of ethylenediaminetetraacetic acid), Versenol* (trisodium salt of (N-hydroxyethyl) ethylenediaminetriacetic acid) and others have chelating properties that make them superior to many natural chelating compounds. The term "chelate" can be applied to many metal complexes, as such, both natural and synthetic, but the term itself does not infer that all of these compounds have the very important properties associated with the successful use of the synthetic metal chelates in the field of plant nutrition. Natural chelating agents are the products of metabolism and, as such, are transitory in the organic cycles that exist in nature. Their importance cannot be overemphasized but their metal-carrying powers are limited since they are eventually destroyed in the soil. The value of manures, or organic matter in general, in producing fertile soils is well recognized but the fertility does not persist forever. In contrast the synthetic chelating agents and their metal chelates are "unnatural" compounds and do not fit into the natural organic cycles therefore are quite stable in soils. This fact is important since it accounts for the persistence of the metal chelates as sources of metal in the soil for considerable periods of time.

### Additional Important Properties of Synthetic Chelates

The chelating agents now manufactured are of definite composition, meet required specifications insuring uniformity of product and their chemical performance under many conditions has been observed. They serve as very useful tools under conditions where it is necessary to control metallic ions. They are very stable compounds, resist decomposition, and are not readily destroyed except by high heat and by powerful oxidizing agents. Most divalent and trivalent metals are chelated over a fairly wide range of pH which means that these metals are effectively sequestered in most common aqueous solutions that are

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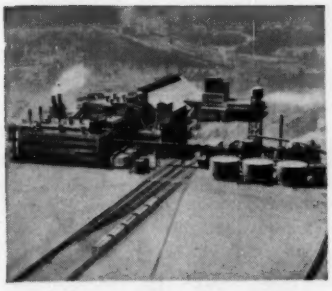
* *Registered trademarks—The Dow Chemical Company*

**Never a delivery worry!**

We've expanded our plant facilities to whittle down delivery schedules ... to ship Run-of-Pile Triple Super *when, where* and the *way* you want it. Try us. We deliver the goods!

## Davison's new Run-of-Pile Triple Superphosphate is guaranteed to satisfy you on every count!

- BETTER AMMONIATION RESULTS—Because of its friable texture, this triple super has a high rate of ammoniation . . . absorbs more pounds of free ammonia per unit of $P_2O_5$.
- HIGH IN $P_2O_5$ CONTENT—Constant high analysis . . . 46-48% A.P.A.
- STORES BETTER—This triple super is shipped in excellent mechanical condition. It is well cured, and milled and screened at time of shipment.
- UNEXCELLED QUALITY—This triple super is backed by Davison's more than a century of experience in fertilizer formulation. It's guaranteed to satisfy you on every count.
- IN STOCK AND READY TO GO —We're ready to ship Davison Run-of-Pile Triple Superphosphate by rail, ship or barge. Write or call today!

**DAVISON**
CHEMICAL COMPANY
Division of W. R. Grace & Co.
Baltimore 3, Maryland


MURIATE
OF POTASH
for the
PLANT FOOD INDUSTRY

THIS symbol stands for high-grade coarse and uniform Muriate of Potash (60% $K_2O$ minimum). Southwest Potash Corporation provides a dependable supply of HIGH-K* Muriate for the plant food industry.

*Trade Mark

Southwest Potash
Corporation

[redacted]

not too acid or alkaline. They have one important property in common with the natural chelating agents and that is, in spite of the large size of their molecular structure, they are readily absorbed and translocated in the tissues of the living plant. Because of this property they have been suspected of toxicity but, like any other compound, they only manifest these symptoms when used in excess. In other words, minute amounts of these synthetic chelates are very efficient sources of metal for living plants.

**Metal Chelates in Nutrient Solutions**

The first experimental work, involving the use of synthetic metal chelate compounds as sources of metals for plant nutrition, was conducted in nutrient cultures. One of the most important problems in nutrient culture is to maintain a proper ionic balance within a limited pH range. Due to the activity of the growing plant in a nutrient solution, the ionic balance is upset and the pH very often increases. When this occurs, the trace metals in solution begin to precipitate and thus lose their nutritional value. The synthetic potassium iron salt of EDTA (ethylenediaminetetraacetic acid) was used as the source of iron in nutrient solutions and found to be stable and a much more efficient source of iron than the inorganic iron salt. It was possible to carry the solutions much longer without an iron precipitate forming and the plants received adequate amounts of iron. This principle has been extended to nutrient culture work in many Experiment Stations and Universities where it is standard procedure to use the metal chelates in making up the solutions. The metal chelates are now used as trace metal carriers in hydroponic cultures where plants are grown on a commercial scale. It is significant to note that cultures of algae thrive under conditions where the trace metals are supplied in the form of chelates rather than as inorganic salts.

**Liquid Fertilizers**

In reality a liquid fertilizer is merely a concentrated form of nutrient solution adapted for growing plants in the soil. Theoretically, the liquid fertilizer is soluble in the soil water and should be readily available to the roots of growing plants. However, in spite of the solubility, much of the phosphate is fixed in the soil and the ammoniacal nitrogen and potassium is absorbed onto the base exchange complex in the

(Continued on page 23)

Arcadian® News

Volume 3 | For Manufacturers of Mixed Fertilizers | Number 5

# How to Make More Money from Mixed Fertilizers

## For Greater Profit – Put More N in N-P-K

**Most of the leading** fertilizer-consuming crops require more nitrogen than any other plant food. Yet, the average mixed fertilizer contains less nitrogen than phosphoric acid and potash. Farmers make up the difference with extra applications of straight nitrogen materials. More nitrogen is sold as straight materials than in mixed fertilizers.

This situation represents a golden opportunity for you as a manufacturer of mixed fertilizers. You can get more of the nitrogen market and more of the total fertilizer market by putting more nitrogen in mixed fertilizers.

### Profitable Arithmetic

You help the farmer save money and you make more money from nitrogen, when you sell it as an ingredient of mixed fertilizers. You get more of the farmer's fertilizer dollar when you supply his nitrogen needs with mixed fertilizers than when you sell him low-nitrogen mixtures that must be supplemented with extra applications of nitrogen.

Figure it out for yourself! Compare your profit per unit of nitrogen in straight materials with your profit per unit of nitrogen in mixed fertilizers. You will quickly see where your profit lies. And some of your customers may buy their mixed fertilizers from you and their straight nitrogen elsewhere. This means that your profit goes elsewhere.

### The Aim and Purpose

Of course, it is not practical to supply all the nitrogen needs of some crops on some soils with mixed fertilizers. But, for most crops on most soils, it is practical, efficient, economical and profitable to supply total plant food

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needs (including sufficient nitrogen) with mixed fertilizers.

### The Aim and Purpose

The basic aim and purpose of "complete" fertilizer is to give the farmer, in one well-conditioned product, all the plant foods that his soil needs to produce the yields he wants. With a well-balanced fertilizer, he can feed his crop with one trip across his field.

When mixed fertilizer contains sufficient nitrogen, it may not be necessary for the farmer to side-dress or top-dress with supplemental nitrogen. This saves him time, labor and equipment and prevents soil compaction by keeping heavy machinery off his plowed and planted fields. Inability to apply extra nitrogen, due to bad weather or lack of time, cannot hurt his yield.

### Farmers Know Advantages

More and more farmers are learning the advantages of high-nitrogen mixed fertilizers. Many experiment stations are recommending 2-1-1, 1-1-1 and 1-2-2 ratios. There is a growing demand for such mixtures as 16-8-8, 14-7-7, 12-12-12, 10-10-10 and 6-12-12. Farmers know that most crops use twice as much nitrogen as phosphoric acid . . . and more nitrogen than potash, especially where crop residues are plowed back.

### The Big Picture

Despite widespread recognition of the obvious need for more nitrogen, the average mixed fertilizer contained 5.39% nitrogen, 12.08% phosphoric acid and 11.2% potash in the 1955-56 fertilizer year. Yet there was a definite trend toward high-nitrogen fertilizers during a year when total mixed fertilizers remained stable.

Mixed fertilizers used in 1955-56 contained 815,000 tons of nitrogen, while straight materials accounted for 1,137,000 tons. This is in contrast with 1,789,000 tons of phosphoric acid and 1,671,000 tons of potash in mixed goods versus 457,000 tons of phosphoric acid and 218,000 tons of potash as straight materials.

**You help your dealer get exclusive customers and repeat sales when you supply the farmer's complete plant food needs with mixed fertilizers.**

### Bigger Profits

You sell more plant food at better profit, when you build your leadership among farmers as a dependable source of supply for mixed fertilizers that supply the complete plant food needs of crops.

When you balance your mixed fertilizer with adequate nitrogen to meet crop requirements you also insure the best possible return from the phosphorus and potash present. This means more farmer satisfaction and more repeat business for you.

You can increase the farmer's profit, your dealer's profit and your own profit, by manufacturing and selling complete fertilizers that contain plenty of nitrogen in balance with other plant foods.

### More Dollar Volume

By producing higher-nitrogen mixed fertilizers, you can put a greater dollar volume of tonnage through your plant. You also make substantial savings in storing and shipping costs per unit of plant food. These costs are becoming more important with increasing freight rates and the necessity to warehouse more

**PLANT FOOD CONTENT OF CROPS**

| Crop | Yield | Part of Crop | N lbs. | $P_2O_5$ lbs. | $K_2O$ lbs. | Total |
|---|---|---|---|---|---|---|
| COTTON | 750 lbs. | lint | | | | |
| | 1,250 lbs. | seed | 60 | 30 | 20 | 110 |
| | 2,000 lbs. | burrs, leaves and stalks | 45 | 15 | 45 | 105 |
| | Total | | 105 | 45 | 65 | 215 |
| CORN | 100 bu. | grain | 90 | 35 | 25 | 150 |
| | 3 tons | stover | 70 | 25 | 95 | 190 |
| | Total | | 160 | 60 | 120 | 340 |
| WHEAT | 40 bu. | grain | 50 | 25 | 15 | 90 |
| | 1.5 tons | straw | 20 | 5 | 35 | 60 |
| | Total | | 70 | 30 | 50 | 150 |
| OATS | 80 bu. | grain | 50 | 20 | 15 | 85 |
| | 2.0 tons | straw | 25 | 15 | 80 | 120 |
| | Total | | 75 | 35 | 95 | 205 |

off-season production to meet peak requirements.

### One Sale—One Package

You enable your dealer to make better use of his storage and trucking facilities. With high-nitrogen mixed fertilizers, he can haul a higher value pay load and have less storage cost per dollar of inventory. You also help your dealer to supply the farmer with his plant food requirements in a one-sale, one-package deal. This reduces selling cost and minimizes the danger of losing business to a competitor.

### Greater Benefits

High-nitrogen mixed fertilizers save the farmer handling and application costs and increase his efficiency. You supply him with plant foods that are chemically hitched and balanced so that he gets greater benefits from everything in his fertilizer. Also, high-nitrogen fertilizers help to take the guesswork out of farming.

### It Pays Many Ways

Start now to supply more of your customers' complete plant food needs with mixed fertilizers. Make sure your analyses include plenty of nitrogen. It pays many ways!

# How to Put More Nitrogen into Mixed Fertilizers

**New ARCADIAN®** Nitrogen Solutions now make it easier than ever before to produce high-analysis, high-nitrogen mixed fertilizers in regular equipment.

### 17% to 30% More Nitrogen

URANA® 6 and NITRANA® 4M Nitrogen Solutions are high in nitrogen and low in free ammonia. These ARCADIAN Solutions, plus sulphate of ammonia, are enabling mixers to put a high-nitrogen content into good quality mixed fertilizers. They decrease the need for nitrogen from other sources.

These Solutions have low vapor pressure. The salting out temperature for URANA 6 is 35°F., just above freezing, and that for NITRANA 4M is 61°F. Now shipped in insulated cars, these Solutions are easy to handle. At the same ammoniation rate as other Solutions, they put 17% to 30% more nitrogen in mixed fertilizers.

It's easy to shift your regular ammoniation methods to the use of URANA 6 or NITRANA 4M. Get the facts from your Nitrogen Division technical service man. These Solutions make it practical to formulate high-analysis, high-nitrogen fertilizers in almost any plant.

| | URANA 6 | NITRANA 4M |
|---|---|---|
| Total Nitrogen | 42.0% | 41.0% |
| Anhydrous Ammonia | 19.5% | 19.0% |
| Ammonium Nitrate | 66.3% | 72.5% |
| Urea | 6.0% | — |
| Water | 8.2% | 8.5% |
| Specific Gravity at 60° F. | 1.178 | 1.194 |
| Salting Out | 34° F. | 61° F. |
| Vapor Pressure at 104° F. | 10 lbs. | 7 lbs. |

### Another Method

Some manufacturers prefer to get a higher nitrogen content by using URANA or NITRANA Nitrogen Solutions high in free ammonia. This can be done by adding sulphuric acid in the mixing process. It amounts to making your own sulphate of ammonia while you are formulating fertilizers.

### Take Your Choice

Either of the above-described methods will produce good-quality fertilizers with real economy. The best method for you depends on plant equipment, cost of materials, and the actual ratios you wish to produce. Your Nitrogen Division technical service man can be helpful to you in selecting the method best adapted to your particular needs.

### More Mixed Fertilizer Sales

Production of high-nitrogen mixed fertilizers will enable you to supply a bigger share of your customers' total plant food needs with mixed fertilizers. You will be diverting business from straight materials into more profitable mixed fertilizers.

For technical help on the production of high-nitrogen mixed fertilizers in your plant, contact Nitrogen Division, Allied Chemical, 40 Rector Street, New York 6, N. Y. This service is available to customers without charge.


**Proper selection of the correct nitrogen solution can help you produce high-nitrogen fertilizers with your regular ammoniating equipment.**

# HERE'S THE BIG LINE OF Arcadian® NITROGEN SOLUTIONS

When you purchase your nitrogen requirements from Nitrogen Division, Allied Chemical, you have many different nitrogen solutions from which to select those best suited to your ammoniation methods and equipment. You are served by America's leading producer of the most complete line of nitrogen products on the market. You get formulation assistance and technical help on manufacturing problems from the Nitrogen Division technical service staff. You benefit from millions of tons of nitrogen experience and the enterprising research that originated and developed nitrogen solutions.

| | CHEMICAL COMPOSITION % | | | | | | PHYSICAL PROPERTIES | | |
|---|---|---|---|---|---|---|---|---|---|
| | Total Nitrogen | Anhydrous Ammonia | Ammonium Nitrate | Urea | Water | Neutralizing Ammonia Per Unit of Total N (lbs.) | Approx. Sp. Grav. at 60°F | Approx. Vap. Press. at 104°F per Sq. In. Gauge | Approx. Temp. at Which Salt Begins to Crystallize °F |
| **NITRANA®** | | | | | | | | | |
| 2 | 41.0 | 22.2 | 65.0 | — | 12.8 | 10.8 | 1.137 | 10 | 21 |
| 2M | 44.0 | 23.8 | 69.8 | — | 6.4 | 10.8 | 1.147 | 18 | 26 |
| 3 | 41.0 | 26.3 | 55.5 | — | 18.2 | 12.8 | 1.079 | 17 | -25 |
| 3M | 44.0 | 28.0 | 60.0 | — | 12.0 | 12.7 | 1.083 | 25 | -36 |
| 3MC | 47.0 | 29.7 | 64.5 | — | 5.8 | 12.6 | 1.089 | 34 | -30 |
| 4 | 37.0 | 16.6 | 66.8 | — | 16.6 | 8.9 | 1.188 | 1 | 56 |
| 4M | 41.0 | 19.0 | 72.5 | — | 8.5 | 9.2 | 1.194 | 7 | 61 |
| 6 | 49.0 | 34.0 | 60.0 | — | 6.0 | 13.9 | 1.052 | 48 | -52 |
| 7 | 45.0 | 25.3 | 69.2 | — | 5.5 | 11.2 | 1.134 | 22 | 1 |
| **URANA®** | | | | | | | | | |
| 10 | 44.4 | 24.5 | 56.0 | 10.0 | 9.5 | 11.0 | 1.108 | 22 | -15 |
| 11 | 41.0 | 19.0 | 58.0 | 11.0 | 12.0 | 9.2 | 1.162 | 10 | 7 |
| 12 | 44.4 | 26.0 | 50.0 | 12.0 | 12.0 | 11.7 | 1.081 | 25 | - 7 |
| 13 | 49.0 | 33.0 | 45.1 | 13.0 | 8.9 | 13.5 | 1.033 | 51 | -17 |
| 15 | 44.0 | 28.0 | 40.0 | 15.0 | 17.0 | 12.7 | 1.052 | 29 | 1 |
| **U-A-S®** | | | | | | | | | |
| A | 45.4 | 36.8 | — | 32.5 | 30.7 | 16.2 | 0.925 | 57 | 16 |
| B | 45.3 | 30.6 | — | 43.1 | 26.3 | 13.5 | 0.972 | 48 | 46 |
| Anhydrous Ammonia | 82.2 | 99.9 | — | — | — | 24.3 | 0.618 | 211 | — |

**Other ARCADIAN® Nitrogen Products: UREA 45 • A-N-L® Nitrogen Fertilizer Ammonium Nitrate • American Nitrate of Soda • Sulphate of Ammonia**

## NITROGEN DIVISION

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soil. In other words, a liquid fertilizer behaves very much as a dry fertilizer except that more of it is available to the growing plant at the time of application.

The development of liquid fertilizers is comparatively new in spite of the fact that plants have been grown in solutions for over 100 years. The fertilizer solutions on the market now vary considerably in their formulation, ingredients and ratios of N-P-K. With continued use and increase in popularity, more information will be obtained about the use of liquid formulations and more efficient and effective compounds will probably be developed. The essential property of solubility places a premium on the purity and cost of ingredients that are used in liquid fertilizers. Therefore, in order to overcome the disadvantage of higher costs, it is necessary for fertilizer solutions to offer some advantage in addition to ease of handling.

Probably the most effective but most expensive dry fertilizers on the market today are those that are fortified with organic matter. The value of organic matter in a fertilizer is well recognized but an important contribution to soil fertility, often overlooked, are the natural chelating agents it produces. About the only organic compound, now used in some liquid fertilizer formulations, is urea which is a relatively simple organic compound with no chelation properties, and serves only as a source of nitrogen.

It is obvious that the growing plant takes more than nitrogen, phosphorus and potassium from the soil. Modern agricultural practice places a severe drain on the other essential elements, such as, calcium, magnesium, sulfur, iron, manganese, zinc, copper, boron and molybdenum, which were believed to exist in adequate amounts in the soil and available to the growing plant. Many dry fertilizer formulations now contain magnesium, sulfur, boron, molybdenum and inorganic salts of iron, manganese, copper and zinc to help in alleviating this situation. The liquid fertilizer formulator is faced with a problem when it becomes necessary to include these other essential elements in a soluble form. Most fertilizer solutions have, essentially, high ionic concentrations due to the soluble forms of N-P-K that are used. When soluble metal salts are added to solutions of this type, the metals often precipitate in the form of insoluble metal phosphates. Some of this precipitation may be prevented by maintaining an acid solution which, in some instances, may prove to be undesirable. In many parts of the country, the water may be alkaline or contain hard water salts. This type of water, if used in the formulation of or the dilution of liquid fertilizers, may bring about an undesirable precipitation of metallic salts.

### What the Addition of a Synthetic Chelate Compound Can Do in Fertilizer Solutions

The use of synthetic chelate compounds in fertilizers is governed by their usefulness and the economics involved. These materials are useful tools, not wonder compounds, and their behavior in solutions is quite well known. Little is known about their absorption into the body of the plant and their function inside the living cell. From all of the experimental work that has been done with these compounds it is estimated that a judicious amount to be used in fertilizer should be in the neighborhood of about 0.5 to 1.0% by weight.

The obvious use of chelate compounds in fertilizers is to increase the solubility and availability of metals. This may be accomplished in several ways: (1) by the addition of metal chelates as such; (2) by solubilizing or chelating metals that may be added as inorganic salts; (3) by solubilizing metals that may be present as impurities or already present in the soil.

In recent years many specialty fertilizers have been developed for use under conditions where known metal deficiencies occur or particular groups of plants are sensitive to specific metals in their nutrition. This is particularly true of the ericaceous plants and their dependency on iron availability. Many fertilizers, both dry and liquid, are now formulated with the metal chelates as sources of the essential trace elements. The liquid fertilizers present more of a problem than the dry on the addition of chelated metals, however, they can often be added to fertilizer solutions in concentrations of from 1 to 5% depending on the formulation.

It has become rather common practice, in an attempt to upgrade some fertilizers, to add metallic salts and provide a more balanced nutrition. This practice is of rather questionable value since, under many soil conditions, these metals are almost immediately fixed and rendered insoluble when they come into contact with the soil. This is not difficult to visualize since the formation of metallic phosphates, carbonates and hydroxides commonly occurs in the soil and these compounds are comparatively insoluble. The addition of a chelating agent to a fertilizer can help to overcome this situation by chelating some of these metals in the presence of soil moisture. Even the insoluble metallic salts, that occur naturally in the soil, may be solubilized through the action of a chelating agent introduced with the fertilizer. This practice has proven to be effective under known conditions of iron deficiency in plants growing on acid soils.

The use of phosphate rock as a source of superphosphate and phosphoric acid for fertilizers introduces a number of metallic impurities many of which are of importance in a balanced nutrition. These metals are of little value in a dry fertilizer because of their insolubility but can be made of some nutritive value by the addition of a chelating agent. In the manufacture of liquid fertilizer, the use of phosphoric acid, soluble potassium salts and hard water impurities often produce insoluble precipitates in the finished product. These detract from the appearance of the fertilizer and indicate that all of the ingredients are not soluble. This situation can often be remedied through the addition of adequate chelating agent.

### Chemical Effects of Chelating Agent in Fertilizer

Since the immediate action of a fertilizer is dependent upon the amount of available or soluble nutritive material, a number of experiments were conducted to determine the effect of chelating agent on the solubility of various metals present in fertilizer. The solubility of N-P-K in a fertilizer is known and often indicated. The solubility and availability of added metals is not indicated. Therefore, to prove the value of a chelating agent in a fertilizer, it is necessary to determine the actual amounts of soluble metals in a solution extract of the fertilizer.

In the following experiments three different types of fertilizers were used; a regular dry fertilizer with a 6-10-4 ratio; a special dry fertilizer for acid-loving plants with a 5-10-10 ratio; and a soluble fertilizer with a ratio of 20-10-15 and containing small amounts of added metals. The dry fertilizers were mixed with 0.5% and 1.0% of the chelating agents Versene and Versenol. Ten percent water suspensions were made of the fertilizer and the mixtures. These suspensions were allowed to stand for a period of 6

days, the pH determined, and the suspensions centrifuged to separate the solid and liquid portions. The liquid portions were then subjected to analysis by means of emission spectrography and the concentrations of soluble metals determined. To test the effect of chelating agent on the soluble fertilizer, mixtures were made up containing 1.5 and 2.0% of both Versene and Versenol. Since this fertilizer is highly concentrated and diluted before using, it was assumed that higher concentrations of chelating agent could be added. Solutions were made up of both the untreated and treated fertilizer and the pH determined. To further test the action of the chelating agents, another set of solutions were made in which the pH had been buffered to a pH of 7 through the use of carbonate ions. This was done to determine the effect of adding alkaline water to the fertilizer or the effect of adding this fertilizer to alkaline soil.

Fig. 1 illustrates the results obtained with a dry fertilizer (6-10-4) and chelating agent. It is not known if this fertilizer is fortified with any metallic salts and the assumption is that the metals exist as impurities. It is a well known fact that the solubility of the heavy metals decreases as the pH increases. The opposite effect is noticed here in that the slight rise in pH, due to the addition of the chelating agent, has resulted in a significant increase in the solubility of these metals. Due to the stability of these metal chelates, it is logical to assume that this increase in solubility would persist even into the relatively high pH found in alkaline soils. There is a slight indication of increase in soluble phosphorus. Since soluble phosphate in dry fertilizer is undoubtedly in the form of soluble calcium phosphate it is not anticipated that the synthetic chelating agents would have much effect on the insoluble calcium phosphate that must be present. It is known that both Versene and Versenol do not effectively chelate the alkaline earth metals, such as calcium and magnesium, under acid pH conditions. The slight increase in soluble phosphorus is most likely due to chelation of the metals in the heavy metal phosphates, such as iron, zinc, manganese, that may be present in insoluble form. Under alkaline conditions both calcium and magnesium in combination with $P_2O_5$ would be effectively chelated provided adequate chelating agent is present.

Fig. II illustrates the effect of adding both Versene and Versenol to a specialty fertilizer developed to maintain or increase soil acidity. The results are quite similar to the preceding except for the lower pH of the fertilizer. The amount of available iron in the untreated fertilizer is extremely low (less than .0001%) and any rise in pH will not increase iron availability. Due to the relatively low pH of the mixtures involved there is not much indication of the difference in efficiency of iron chelation between Versene and Versenol. If the pH were raised to 6.5 or higher, the chelation of iron by Versenol would exceed that chelated by Versene. The amount of soluble manganese, indicated as present in the untreated fertilizer, would suggest that some soluble manganese salt is added to this specialty fertilizer. The solubility of manganese is quite sensitive to increasing alkalinity but the chelating agents appear to offset the effect of rising pH on solubility.

Figures III-VII show the effects of adding Versene and Versenol at 1.5 and 2.0% to a concentrated fertilizer (20-10-15) fortified with metal salts. The pH of the original fertilizer is extremely acid, pH 3.7. This acidity must be maintained to solubilize the

**FIG. I**

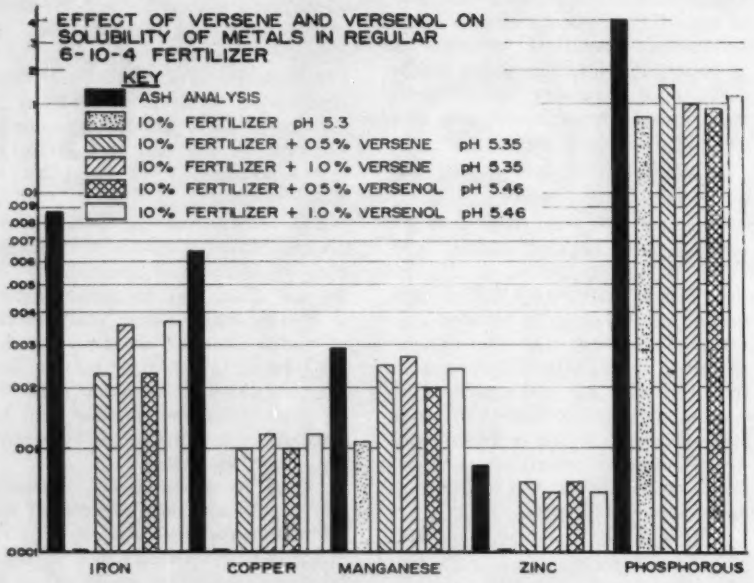
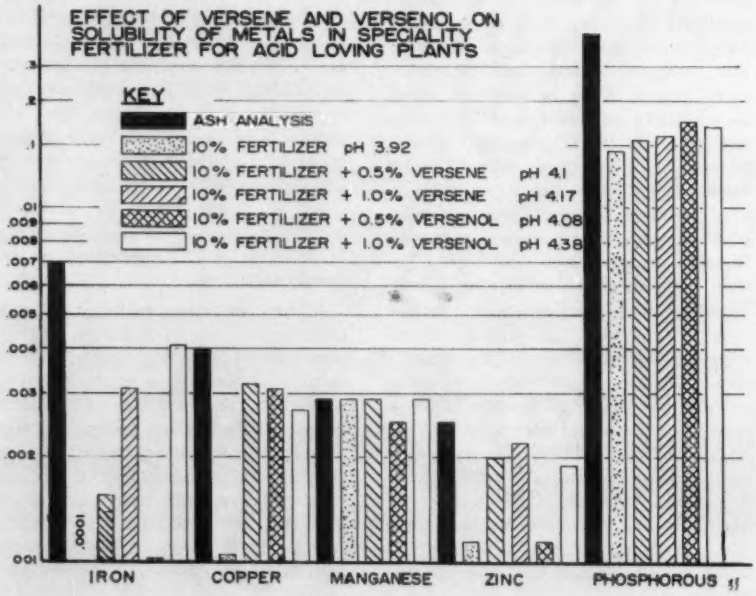
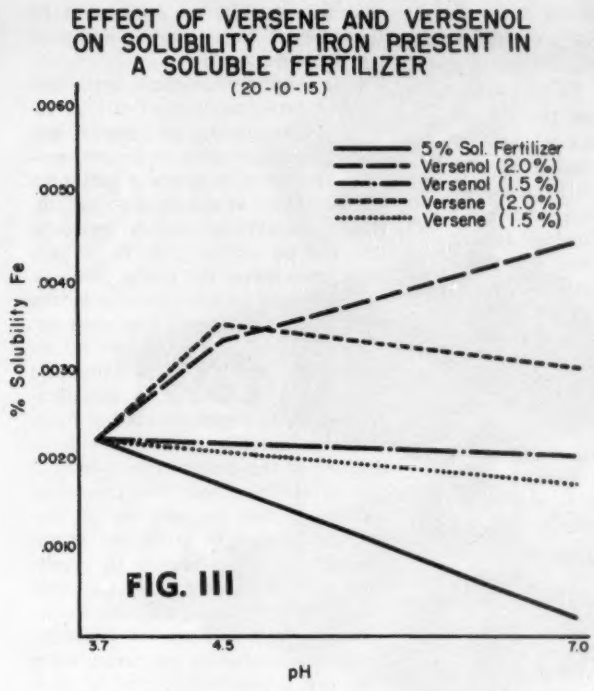
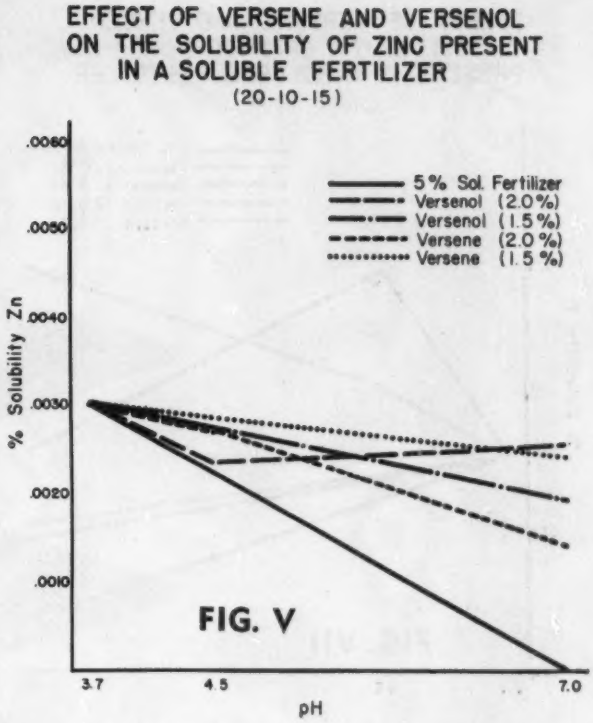


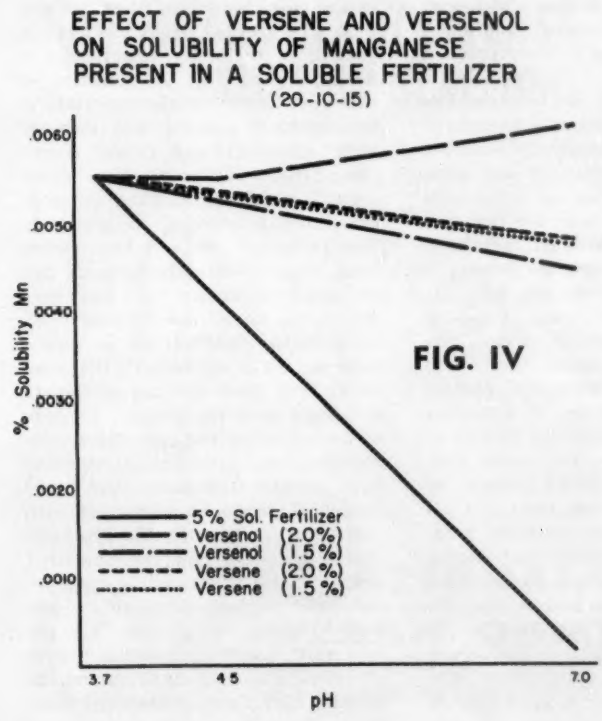

**FIG. II**

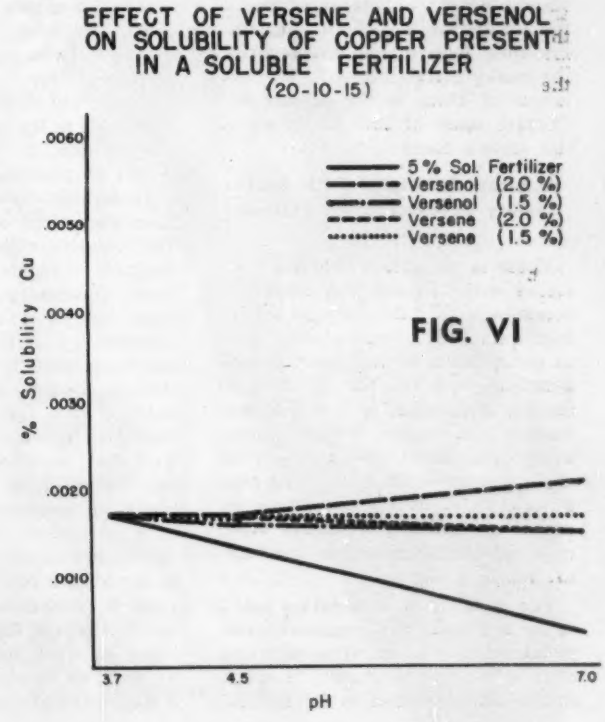


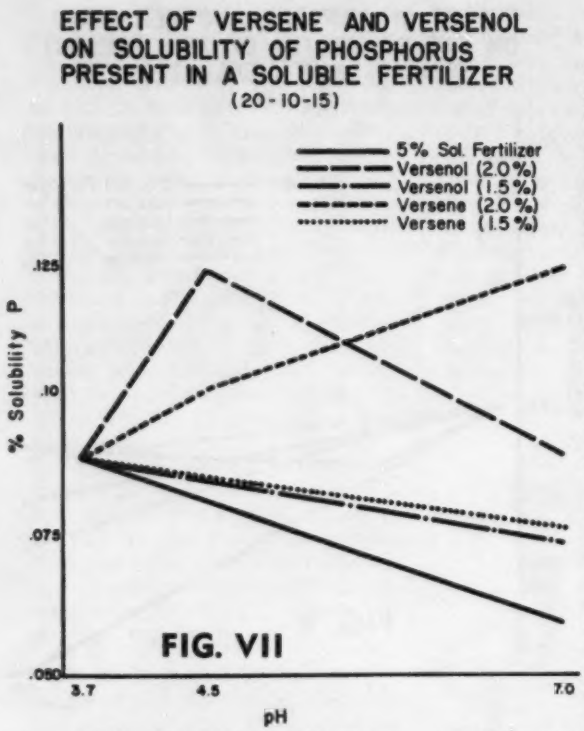



metals present. Even this is not too effective since, on the addition of water, a suspension and not a true solution is formed. When the chelating agents are added to the fertilizer and then dissolved in water, the resultant solution has a pH of 4.5, and is relatively clear. The addition of carbonate ions to the original fertilizer solution, to raise the pH to 7, increases the amount of precipitate. There was no appreciable change in the appearance of the solutions containing chelating agent when the pH was raised to 7. This, of course, indicates the effective solubilizing action of the chelating agents. The effect of raising the pH to 7 was quite striking in regard to the solubility of the metals in the untreated fertilizer. The solubility of all the heavy metals was practically reduced to zero. The fertilizer solutions containing chelating agent showed an increase in soluble iron and manganese as the pH was raised and the other metals






were maintained at a level of solubility equivalent to that present in the original acid solution of pH 3.7. The effect on soluble phosphorus is apparently significant since, in all instances, the chelating agent increased the amount of soluble phosphorus in solution. This is not surprising since the phosphorus present is undoubtedly in the form of ammonium phosphate and some of the phosphate may be fixed in an insoluble form due to the action of the heavy metals present. The chelation of these heavy metals will liberate some of this phosphate in the soluble form.

### Problems Associated With Adding Chelate Compounds To Fertilizer Solutions

There is no serious problem associated with the addition of chelate compounds to either dry or soluble fertilizers. It is now being done in many parts of the country with beneficial results. The addition of chelate compounds to liquid formulations does require some technical knowledge about the behavior of chelating agents under varying conditions. To produce a clear, true solution of fertilizer elements often requires careful control in the manufacturing process.

The addition of a chelating agent or metal chelate to nitrogen agent or metal chelate to nitrogen solutions often presents a problem. If much of the nitrogen used is in the ammonical form then it is necessary to maintain an acid pH of the solution when the chelating agent is added. The chelating agent, as such, is strongly alkaline and has a buffering capacity. If the addition of chelating agent raises the pH above 7 the ammonia in solution will be driven off as a vapor upsetting the N ratio in the finished fertilizer. If the fertilizer solution is strongly buffered on the acid side, this situation will not occur. There is not much effect, if any, when the nitrogen fertilizer is in the form of nitrate or urea.

Probably the phosphatic portion of liquid fertilizers contributes to most of the difficulty encountered on the addition of chelate compounds. The chemistry of the synthetic metal chelates shows that they are stable in the presence of phosphate anions and, under ordinary circumstances, will not break down. However, in the presence of excess phosphate anions, which may occur in highly concentrated fertilizer solutions, due to dissociation it is possible for some of the metal to be removed from the chelate and deposited as the insoluble phosphate. In addition, if relatively impure forms of phosphoric acid are used, considerable trouble in solubilization may occur due to the presence of excessive amounts of metals. If calcium or magnesium are present in large amounts in an acid formulation, quantities of their insoluble phosphate salts may be formed. The chelating agents, under these conditions, cannot effectively chelate calcium or magnesium to solubilize the salt. If aluminum is present in excessive amounts, i.e., more than can be chelated by the amount of chelating agent added, then at a pH of 4 or higher, the insoluble gelatinous aluminum hydroxide begins to form. If a relatively impure, wet process phosphoric acid is to be used, it would be advisable to remove as much insoluble precipitate as possible before formulation into a fertilizer solution. A good deal of this trouble can be eliminated by the use of purer forms of phosphoric acid.

It is possible that some impurities may be introduced into fertilizer solutions through the addition of soluble potassium salts or caustic potash. However, it appears that high concentration of potassium ions limit the amount of chelate material that can be added. This is particularly true when the metal chelates, as such, are added directly to the fertilizer formulation. This does not mean that it is impossible to include rational amounts of potassium in liquid formulations in the presence of chelate compounds but more attention must be paid to the ionic balance of the fertilizer as whole.

It is obvious from the preceding statements that the addition of chelate compounds to fertilizers is not a simple problem under all conditions. To facilitate this problem, The Dow Chemical Company maintains an analytical service for fertilizer manufacturers or formulators who are interested in adding chelate materials to their fertilizers. If information is required along this line, it is suggested that contact be made with Agricultural Chemical Sales, The Dow Chemical Company, Midland, Michigan.

### Summary

Most of the experimental work done in the field of plant nutrition with synthetic chelate compounds indicates that they contribute much to the metal nutrition of plants and that the general overall effect on growth is distinctly beneficial. It would appear that the addition of these synthetic chelate materials to fertilizers, in general, will increase their efficiency and create conditions more optimum for plant growth which agriculture in modern times is striving to approach. The foregoing information shows what these chelate compounds can do under laboratory conditions which has been substantiated by work in the field. It by no means indicates all of the benefits that may be derived from the use of chelate materials since no mention is made of the effect on soil microflora, ammonification, nitrification, respiration, growth stimulation and other biological processes associated with chelation. To be sure, the synthetic chelating agents now manufactured and available at reasonable costs are not the perfect compounds one would desire to perform all the necessary functions associated with chelation but they have proven to be very useful and economical tools.

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# THE MESSAGE

*about home garden benefits from greater plant food use*

# MUST GET THROUGH

*by* Erwin H. Klaus

**E. H. Klaus**

*Mr. Klaus, widely known marketing authority, has been a contributing editor to* Western Feed & Seed *magazine since 1952. He has held positions with leading advertising agencies and headed his own company specializing in merchandising and sales promotion. Well qualified to speak with authority on specialty fertilizer marketing, he was marketing manager for Northrup, King & Co. in Minneapolis and Berkeley for five years, and has more recently been associated with Ravel Bros., Albuquerque fertilizer manufacturers and distributors of farm and garden supplies, as manager of retail operations. He speaks frankly and sincerely in this article specially prepared for* Commercial Fertilizer*'s readers, and calls for action which is sorely needed.*

The future of business lies in understanding the buyer. Application of this basic marketing concept to selling fertilizer means we must first understand that our buyer understands very little about how to use fertilizer. He understands even less about the benefits to be derived from the proper use of fertilizer. Consequently he uses far less than he should. So a tremendous market is lost every year. How can we cut down this loss?

Essentially there are two fertilizer buyers—the farmer and the home owner. That the farmer's understanding of fertilizer use is limited was proven by the recent survey National Analysts, Inc., a leading research organization, conducted for the National Plant Food Institute and recently made available to the industry.

If the farmer understands too little about a product that to him means benefits in terms of higher profits, then the home owner is more than likely to understand even less. He, except in cases where well kept grounds will add to the saleability of a house, has no profit incentive. His only incentive is the enjoyment he gets from the way his grounds look. So even without the benefit of such detailed data as were turned up in the farm fertilizer study, we can agree on the answer **—the home-owner doesn't understand nearly enough.**

### Market is Undersold

Swift & Company's Al Bowers helps out with data Swift obtained from a survey made last year. Here are some of the highlights:

60 per cent of home owners use plant food; 40 per cent do not.

Of those using plant food, 55 per cent use it on flowers, 54 per cent on vegetables; but **only 38 per cent on lawns,** 34 per cent on trees and 23 per cent on shrubs.

Converted to percentages of total home owners, the figures show this picture of an undersold market:

Home owners using plant food on: flowers 33%, vegetables 32%, lawns 23%, trees 20%, shrubs 14%.

Take the lawn figure alone and transpose it into lawn acreage that doesn't get fed, and you begin to **get a grasp of the size of the market than can be developed!**

### Market Can Be More Than Doubled

It is most undersold in the South where, according to the Swift survey, only 20 per cent of all home owners feed their lawns. Slightly more (22 per cent) do so in the North and the Pacific Coast shines with 38 per cent. But even most of the home owners who fertilize do not use nearly enough. While specific data are not available, we know from experience that many home owners, possibly a majority, feed lawns only once a year, when they should fertilize two or three times a year. It requires no great stretch of imagination to arrive at a market potential for plant food that is probably better than twice the size of the present market. The fertilizer industry is capable of producing enough fertilizer to supply that large a market. The problem therefore is how to build the market.

### Education is Needed

Comments Al Bowers, "we find that a tremendous educational job needs to be done on the gardening public on the benefits of supplemental fertilization of lawns and gardens. While a large share of them will use plant food in the spring, they do no summer feeding—a practice which is essential for best growth of lawns and ornamentals."

Who can do this "tremendous educational job?" Obviously, tackling it is beyond the scope of even the largest fertilizer manufacturers. Their advertising and merchandising programs and educational salesmanship on the dealer level improve from year to year. Yet, as the record shows, efforts made to date haven't come nearly close enough to make substantial inroads on the unsold market.

The message that has been told didn't get through. It made it all sound pretty complicated rather than simple. It created the image of sweat and labor, both physical and mental. It made Mr. and Mrs. Home Owner feel they had to learn a great deal about plant nutrients.

That is alright for the experts, for the perfectionists, but not for the new generation of millions of suburbanites. To get through, the message will have to be told more simply, more gracefully, more pleasantly. It should be told with a light touch, and not be lacking in humor.

Why does a housewife want a vacuum cleaner? An electric dishwasher? Because it gets her job done easier, more efficiently, with less effort. This, in essence, is the message. "You, Mr. and Mrs. Homeowner, can enjoy looking at a lawn that will make you feel proud . . . enjoy greener and richer looking shrubbery, more beautifully growing flowers, larger and more appetizing fruits and vegetables. And it's

easy. Think of what you get from that half hour or so it may take to put on that plant food, and you find that a litle bit of effort turns work into play . . . a chore into pastime . . . and get you the admiration of your friends and neighbors."

### Who Can Get The Message Through?

That is the sort of message that will get through. Let advertising copy pre-testers and motivation researchers check it, and they will come up with the same basic finding. But it must be told time and again, through many media. By whom?

We know that what manufacturers and dealers have done to date, what they are doing this year, is not enough . . . neither in appeal nor volume. Who then can tell the message? The manufacturer has organizations, 22 of them throughout the country. What can they do?

They can get together, pool funds, and start innovating. Innovating? Yes, for innovation is their business. They do so in production. They continuously innovate new, improved plant food products. They build new, more efficient mills. Yet, **it is more important to own a market than a mill.**

Therefore innovation must have the central purpose of creating a new concept of the market . . . of understanding the buyer . . . of making the buyer understand how he benefits. Innovation may take the form of an entirely new agency, or an educational effort under the aegis of the National Plant Food Institute. The form matters less than the content. The content are people—public relations experts, if you will—with the knowhow of telling the kind of message that will get through. And the only message that will get through is that which sells the idea. Many industry groups have done it. Why shouldn't the plant food industry do it? It can be done by—

1. Getting to one and all who are read in the newspapers and magazines, who are listened to on the radio and seen on the televisions stations—writing and talking about gardening. They can sell the idea.
2. Getting to the Manufacturers, their advertising and public relations agencies, so they may tell the message—the same message—time and again, in their advertising, in their product literature, on the displays, in sales and dealer training sessions. They can help sell the idea, and thereby will do a better job of selling the brand.
3. Getting to the dealers, through their trade papers, through manufacturers' efforts, showing the dealers and their people how to get the message—the same message—across in the daily man-to-man selling effort. They can help sell the idea, and thereby deliver more benefits to their customers. Result: more plant food sales.

Plant food is the home gardener's bettter mousetrap. Maybe in Walt Whitman's time people beat a path to the door of the place with the better mousetrap. Not so today. You have to bring the better mousetrap to the people, millions of them. And you have to show them how easily they can use it. You must get the message through!

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*California*

# FOREST SOILS CONFERENCE

Ninety persons attended the California Forest Soils Fertilization Conference at Sonora, California, staged by the National Plant Food Institute and the California Fertilizer Association, co-sponsors of the event. The University of California lent its full cooperation. Dr. Russell Coleman, executive vice president of the National Plant Food Institute, acted as conference chairman.

Attendance was largely from the western part of the country, though several of those present were from the east and south, and one person each came from Canada and Germany.

The Conference was called in order to acquaint Californians interested in timber and watershed management with the benefits which can accrue from the use of commercial fertilizers, in the increased production of natural seed cones, and in speeding the growth of forest trees to saw timber size, as determined by qualified technicians in fertilizer research in other countries of the world, and in our own deep South and Pacific Northwest areas. A research program was proposed for California, which is being considered by the timber and fertilizer industries.

It was pointed out in the program that in Japan, experiments conducted over a long period of time under the direction of Dr. Takeo Shibamoto of Tokyo University, have shown that fertilized Chryptomeria, a species of cedar, one of Japan's commercial trees, reach maturity ten years earlier than the untreated trees.

Knox Marshall, forest engineer, Western Pine Association, Sacramento, told the Conference that very little work has been done to date on fertilization of forest soils in California. He pointed out that the lumberman has other problems which have kept him engrossed, such as fire, insect damage, and disease. He said that of the 17 million acres of commercial forest land in the State, over 11 million acres remain in old-growth timber. Concern is developing over problems of regeneration and growth, as well as protection, on the cut-over lands. He said there is need for better knowledge as to what natural growth can be expected in second growth stands, before the possible benefits of fertilization can be properly measured, but that the owners of second-growth tree farms will be interested in any economic means of stimulating growth of their trees. He felt the use of fertilizers would be beneficial in this area, and in overcoming regeneration problems.

Dr. R. B. Walker, department of botany, University of Washington, Seattle, reported on results to date of extensive forest soils fertilization research in Washington State, under the direction of Dr. Stanley P. Gessell, department of forestry, University of Washington, in which he had collaborated. Dr. Walker said that fertilization of forest trees will assume more importance as virgin timber becomes scarcer, and as timber operators depend more on second growth for saw timber. He said that the nutrient removal from the soil

by many commercial lumber trees approaches that of agricultural crops. In greenhouse studies, it has been shown that nitrogen, applied at the rate of 50 pounds per acre, produced a 50% increase in terminal leader growth of Douglas fir and Western Red Cedar.

He reported good growth increases of trees to which nitrogen, nitrogen-phosphate, and complete nitrogen-phosphate-potash had been applied. He said that fertilizer tends to increase the mortality rate of suppressed trees in overstocked young stands, through increased competition, thus accelerating the natural thinning process.

Dr. Walker commented that larger and steadier production of seed occurs when Douglas fir is fertilized, using about 200 pounds of nitrogen, and 100 pounds of phosphate per acre around seed trees, and that under these conditions, total seed production may be increased four to seven-fold, and lateral short elongation increased 25 to 60%.

He reported that Crown-Zellerbach Corporation has been testing the placement of very slowly soluble pellets of urea-formaldehyde and superphosphate in some of its timber plantation land along the Coast, with excellent results. Christmas tree color is improved he concluded.

Dr. E. T. York, northeast manager, American Potash Institute, Washington, D.C., told of his observations of forest soil fertilization research during a recent visit to West Germany, and showed some excellent color slides, to illustrate the value of fertilization. He reported a U. S. Forest Service estimate that if industrial wood maintains its present relative place in the U. S. economy, the demand could be as much as 40% greater in 1957 than it was in 1952, and that this demand could be more than double present needs by the year 2000.

Dr. York pointed out that efforts must be directed towards increasing the productivity of our forest lands, and that it is natural that attention be directed toward possible economic use of fertilizers. He said that to date, little work has been done on the subject of forest soil fertilization research in the United States, but since World War II, work which had been going on in Europe has been speeded up. He specifically named Great Britain, Sweden, Denmark, Holland and Germany.

The most commonly observed nutrient deficiency symptoms are those of nitrogen, phosphorus, potassium, and magnesium, which show up on trees in much the same manner as they do on agricultural crops. He said that numerous experiments in Europe have indicated responses to commercial fertilizers on relatively infertile soils. He reported little work has been done to date to determine how frequently fertilizer should be applied to forest areas. Nitrogen deficiency symptoms are common in Sweden within two to three years after application. In Great Britain, phosphorus gives good response ten years or more after application, and potash carry-over benefits are apparent for a somewhat shorter period.

Dr. York suggested that foliar analysis may offer the best means of diagnosing fertilizer needs of established trees. This procedure will necessitate development of carefully standardized sampling techniques for best results.

### VANISHING SOFTWOODS

With the demand for wood products expected to double by the year 2,000—which is not as far away as it sounds—the wood supply, especially the supply of softwoods, is not rising in proportion. Unless woodland management is put on a more efficient level, a real problem will develop. The Government is asking for more tree planting, and as you can infer from the California forest meeting, our own industry is being alerted to get more actively into the picture.

Dr. L. C. Walker, of the school of forestry, University of Georgia, Athens, Georgia, brought the Conference up to date on work under way in his State, and exhibited a number of slides. He said that soil fertility experiments there "are tragically behind schedule." He expects that prices for pulpwood will continue to rise, and that by 1967, the economics of fertilizing southern pines may be well established. Meanwhile, research is underway and it is hoped that many questions will soon be answered.

Each year for the last eighteen years, an average of 150,000 acres of agricultural land has been abandoned in Georgia, which has gone into pine forest. This brings into focus the importance of forest soil fertilization in these areas, he said.

In South Georgia, the U. S. Forest Service is conducting an experiment on a deep soil, but poorly drained because of a high water table. "Treatment was highly significant a year after fertilization for slash pine height growth," said Dr. Walker. "Trees in unfertilized plots averaged 22.5 inches. Fertilized trees exceeded 30 inches for high NPK application."

Dr. Paul J. Zinke, assistant professor of forestry, University of California, and Gilbert H. Schubert, research forester, California Forest and Range Experiment Station, both of Berkeley, reported on their work. Dr. Zinke showed a number of slides in connection with his work, which indicated significant response to fertilization of ponderosa pine seedlings growing in a sub-soil borrow-pit about 100 miles south of Sonora.

Schubert said that "fertilizing seed trees may be one way to improve reforestation of cut-over and fire-destroyed timber stands in California." In connection with pine cone production, he said that in the spring of 1951 four pairs of dominant sugar pines, ranging in diameter from 27 to 52 inches, were treated with 100 pounds of ammonium phosphate (16-20-0) per tree. Four similar pairs of trees were left untreated. None of the trees bore cones in 1951. In 1952, four of the fertilized trees bore more cones than their unfertilized counterparts, and four had less cones. During the four-year period 1953 to 1956, when the fertilizer may have had an effect on cone production, the fertilized trees produced nearly three times as many cones as the unfertilized trees.

Following the banquet, Dr. Edward C. Stone was the featured speaker. Dr. Stone is assistant professor of forestry, University of California, Berkeley. He said that about 42 million acres, or two-fifths of the area of California, can be classified as forest land. Of this, 17 million, or nearly one half, is classified as commercial forest land. One third of this commercial forest land is understocked, and will require intensive management if its full growth potential of one billion board feet annually is to be realized.

Dr. Stone pointed out that the soil fertility level will affect both the initial survival and any relative advantage the tree seedling may or may not have over surrounding brush. "However," he said, "the key question is 'will a dollar's worth of fertilizer used today pay its way if it has to be carried on the books at 3 or 4% interest for 50 or 75 years'?" He said it is hard to evaluate the results obtained elsewhere relative to conditions existing in California.

"To answer this question for all areas in the State will require a major research effort," he added. "However, a research program initially limited to two species and 10 soil types would not be expensive and could be highly effective. Such a program should make it possible to clearly define and evaluate the

*Just as you see it* ✻ *here...*

# MULTIWALL BAGS

## with a BACKGROUND

by

Raymond

BAG CORPORATION

A division of Alabama Paper Mills, Co.

MIDDLETOWN, OHIO • RICHMOND, VA.


✻ This is Raymond Pre-Printed Burlap Background on 50 lb. unbleached multiwall kraft which can be economically combined with your regular bag design and specifications. Other Raymond basic background designs and colors are available on colored, bleached or semi-bleached kraft. For full details on the interesting possibilities this new packaging concept can give your product, see, write or call your Raymond representative.

potential role of fertilizers in forest management. — The data obtained should be immediately useful in the operation of forest nurseries in the State."

Dr. Stone submitted a suggested forest fertilization research program for California, which, if it can be financed, will be carried out under the direction of the School of Forestry, University of California. Representatives of the timber interests, of the fertilizer industry, and of the University are now giving the proposal consideration.

## National Shade Tree Conference May 21-24

Meeting at the fabulous Disneyland Hotel, Anaheim, Calif., May 21-24, the National Shade Tree Conference, Western Chapter, will hold its 25th annual meeting. The meeting embraces ten Western states and there will be representation from British Columbia and Hawaii.

A very full business schedule has been planned, with outstanding speakers representing the full range of the subject. A guided tour through Disneyland is provided for in the agenda.

## Soil and Water Management Course

The University of California is sponsoring a series of short courses on Soil and Water Management. Although this is of local interest primarily, it is typical of the programs that are being extended throughout the state by the university.

This latest "School on Principals of Soil and Water Management in Relation to Crop Production" is being presented in Visalia, and is open to growers, fertilizer salesmen, dealers, agriculturalists, and to all other persons interested in soil and water management.

The school commenced March 20 and is continuing every Thursday night through May 29. Still remaining to be held in May or these:

May 8—"Phosphorous and Microelement Fertility." Frank T. Bingham, assistant chemist, department of soils and plant nutrition, Riverside.

May 15—"Tree Crop Fertilization." Walter Reuther, chairman, department of horticulture, Riverside.

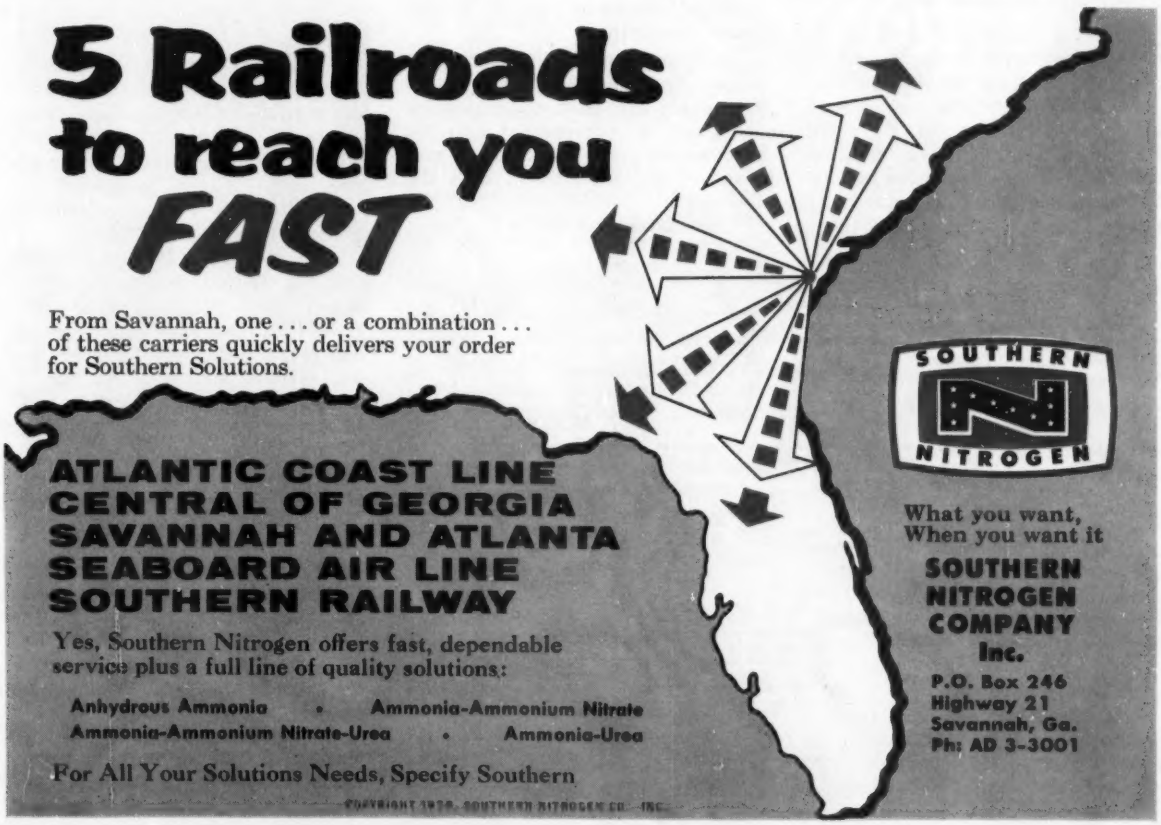
May 22—"Field and Vegetable Crop Fertilization." Oscar A. Lorenz, vice-chairman, department of vegetable crops, Riverside.

May 29—"Resume of Management Principles and Practices."

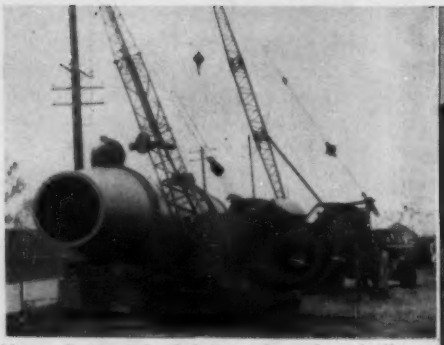
## Stengel Process Licensed by CSC

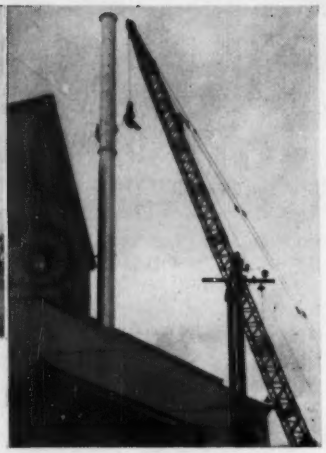
Commercial Solvents has negotiated a world-wide license under which Ford, Bacon and Davis, Inc., New York engineers will design, construct and equip production facilities for those desiring to produce ammonium nitrate by the Stengel process, or any of the other high nitrogen chemicals which can be produced on the same equipment. This is the equipment used by Commercial Solvents at their Sterlington plant and the Northwest Nitro-Chemicals operation at Medicine Hat, Alberta, Canada.

Completely integrated plants for ammonia and nitric acid may also be included in the design program if desired. Ford, Bacon and Davis have developed standard equipment which is flexible for many ammonium variants, and is for production of upwards of 350 daily tons. Their headquarters are at 39 Broadway, New York, with a southern branch office at 3901 Jackson St., Monroe, Louisiana.

# SMITH AG. CHEM. ADDS NEW GRANULAR SYSTEM





**Above:** Cranes unloaded dryer drum from trailer for installation at plant.
**Right:** Cranes were also used to hoist 100-ft. scrubber stack.

A complete granular fertilizer system was recently installed at the Smith Agricultural Chemical Company plant in Indianapolis by Fertilizer Construction Company, of Green Bay, Wisconsin.

The system, which incorporates screening of all granular materials between the dryer and cooler, allows for recycling of hot fines to the ammoniator. The principal advantage of recycling material before fines enter the cooler is the decreased load and subsequent lower ex-cooler product temperatures.

As noted in the flow diagram, this system also provides for flexibility by processing non-granular grades on a continuous basis, utilizing only a portion of the equipment.

As it is sometimes difficult to maintain elevated temperatures in the ammoniator, at times when temperatures are a definite requirement for good granulation, many systems add excess acid to obtain required heat; as this is an expensive method of bringing up the temperature, any other technique for gaining heat is desirable. In practice, it is impossible to measure the savings involved, but when recycle rates are high, and fines can be routed back to the ammoniator as quickly as they are screened, some thermal economies can be realized on a long range basis. This technique is claimed as an added advantage of screening the product between the dryer and cooler.

While it is desirable to recycle the fines at the same rate they are collected, there are surges and circumstances that make it desirable to reduce or increase rate of feed, thus a variable speed screw conveyor is used. Electrically remote-controlled, the unit can be operated from the operator's platform near the ammoniator discharge.

An innovation, developed by Fertilizer Engineering & Equipment Co., which furnished equipment for the plant, is incorporated into the ammoniator-granulator drum. A preblender* section, integral with the drum, receives combined dry materials and mixes these ingredients before discharging directly into the ammoniation section without handling after mixing, eliminating possible segregation of the various materials. The existing batch mixer was eliminated by this added feature.

* Patents applied for.

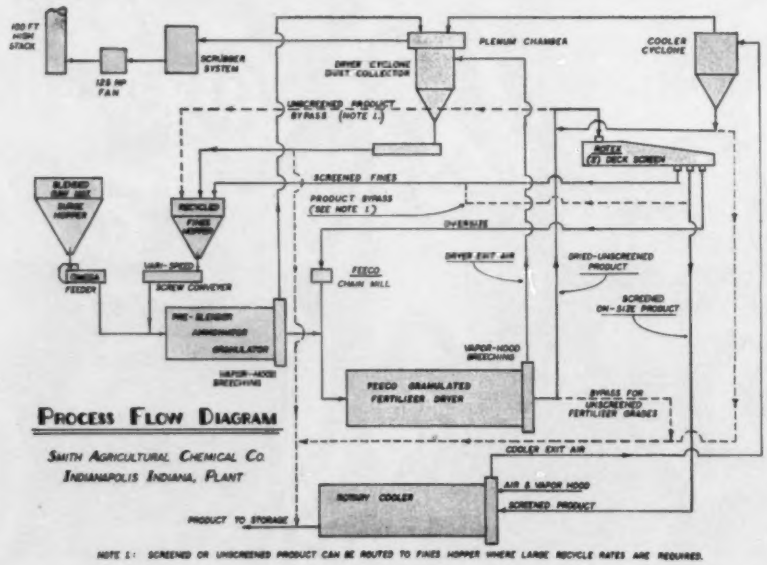
As shown in the flow diagram, there is considerable flexibility in operating techniques. For example, semi-granular goods can be produced when by-passing the screening operation. Also, unscreened materials (ex-dryer), as well as screened product, can be routed to the recycle system, to supplement normally produced fines when very high re-cycle rates are required.

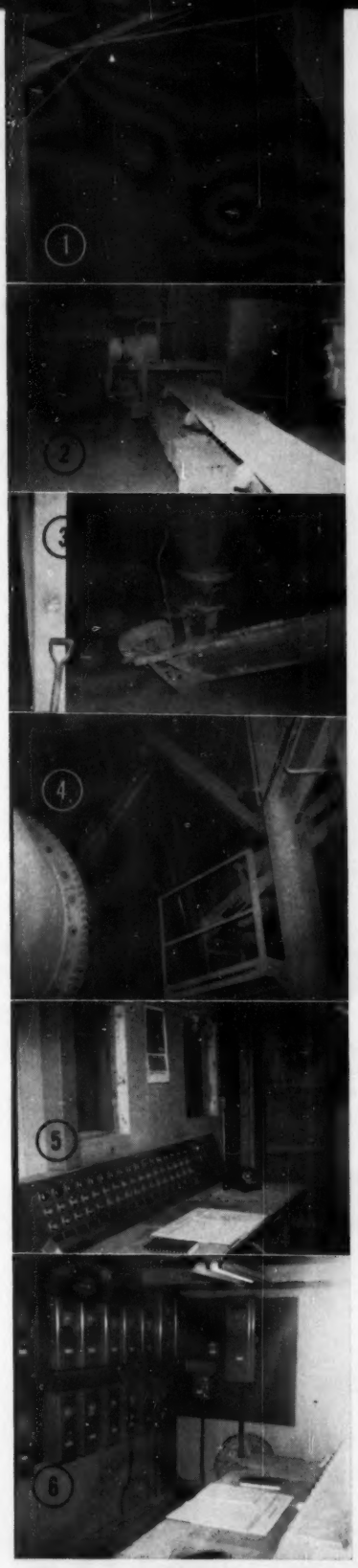
In addition, the system includes a cycle dust collector and fines return system to re-cycle. Air from the cyclones goes to a wet scrubber system, and collected sludge can also be returned to the ammoniator, to reclaim its plant food content.

Equipment includes gravimetric feed of dry materials, continuous ammoniation, metering of all liquid flow, anhydrous ammonia vaporizer and pre-cooler, screening and crushing system, and a drying system composed of an 8' diameter x 40' long, rotary, co-current granular fertilizer dryer complete with refractory lined combustion chamber dual fuel (gas or oil) burner, and automatic modulating controls with flame safety system.

The installation features a centralized control room with an electrical push-button control station, control for the variable screw feeder, and main starter switches, all handy to the operators at the ammoniator discharge.

The contract on a turn key basis was let in August, 1957, and work was completed by the Fertilizer Construction Co. by the end of the year.





1. Feed to preblender, located above dryer drum.
2. Product conveyor from dryer.
3. Air valve and screw conveyor from dryer cyclone.
4. Separation from sizing screen carries product to cooler, oversize to conveyor, fines to elevator.
5. Labeled-pushbutton control panel.
6. Electrical controls on rear wall of control room.

# Around the Map

## ALABAMA

**Centrala Farmers Co-op,** Selma, last month topped all records in its 22 year history with loading on farmers trucks of 75,000 bags of mixed goods in one week. This is some 10,000 bags more than the previous record week, according to Ernest B. Johnson, manager. Mr. Johnson pointed out that the locally owned co-op has paid more than $3,500,000 in dividends, and over $2,000,000 in locally bought supplies, salaries, taxes and insurance.

## CALIFORNIA

**Valley Nitrogen Producers, Inc.,** reports more than one fourth of the $5,000,000 to be subscribed by farmers has been received and more is being invested at the rate of more than $300,000 a week. The remaining $3,500,000 will be obtained from commercial financing sources. Construction of the $8,500,000 fertilizer manufacturing plant in the Fresno area is expected to begin early this summer.

The fertilizer cooperative, the first such organization on the west coast, plans to produce about 50,000 tons of anhydrous ammonia annually, along with aqua ammonia and other liquid mixes. The plant also will be rigged to turn out ammonium sulfate and other simple dry fertilizers.

The plant will be patterned after the operation of the Mississippi Chemical Corporation, in Yazoo City, Miss.

Organizers emphasized the cooperative will not be tax exempt but will be taxed exactly as are privately owned firms. Stock can be sold only to farmer users and to farmer cooperatives.

A location for the plant has not been determined definitely but the spokesmen said it will be built in the Fresno area because of the adequate supplies of natural gas and electric power and easy access to highway and rail transportation.

Included on the cooperative's board of directors are Louis A. Rozzoni of Clements, San Joaquin County, the president of the state farm bureau federation; Sherman Thomas and Jack Harris, both of Five Points; H. L. Stanley of Stratford, Kings County; Sam Hamburg, Los Banos; Roland F. Hill and Victor L. Sandell, both of Fresno; Carl H. Haas, Modesto; Lester S. Heringer, Clarksburg, Yolo County and Mervyn Voth, Wasco, Kern County.

* * *

**The Pacific Guano Co.** will establish a plant in Stockton for the manufacture and distribution of agricultural chemicals and Gaviota garden products, company officials announced.

The firm will occupy a a 60x160-foot building on which Pacific Guano has taken a 10-year lease with an option to renew for 10 years. Construction of the concrete building will begin as soon as weather permits and will be completed within 60 days.

Jack Hollingshead, Pacific Guano assistant sales manager, said the company will employ an estimated 10 to 15 persons, including sales persons and plant workers, on a year-round basis.

* * *

**Wilson & Geo. Meyer & Co.,** 108-year-old Western distributor of agricultural and industrial chemicals, plastics, coke, peat moss and other products, officially dedicated its new enlarged Southern California offices, warehouse and bulk storage facilities on April 2.

The new plant, located at 2060 South Garfield Blvd., Los Angeles, was erected at a cost of about $500,000. It doubles the firm's former Southern California facilities.

Wilson Meyer, company president, San Francisco, and T. W. Harris, Southern California manager, officiated at the dedicatory ceremonies.

Among the firms and products which the Meyer company represents are Stauffer Chemical Company and Western Phosphates, Inc., phosphatic fertilizers; Norsk Hydro, Norwegian calcium nitrate and urea; Semet-Solvay, coke; Canadian Peat


At the dedication of Meyer Company's new plant: Jefferey W. Meyer, vice-president, San Francisco; T. W. Harris, vice-president and manager, Southwestern division; John Hooper, manager, agricultural sales, Southwestern division; Wilson Meyer, president.

Moss Co. Ltd., peat moss; Eastman Chemical Products, Inc., plastics, chemicals, solvents, synthetic fibres and other products.

The firm, with headquarters in San Francisco, also has district offices in Portland, Seattle and Salt Lake City.

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## COLORADO

**Organics Inc.** have launched on the Denver market a fertilizer named "The Real McCoy," a 10-6-4 blending of dehydrated, weed-free cattle manure and commercial fertilizer. It is being produced in the new $200,000 plant built during the Winter. President of the concern is Gordon L. Sutherland.

## FLORIDA

**Davison Chemical Company** has added facilities costing nearly $1,500,000 to the Bartow triple superphosphate plant to produce run-of-pile triple superphosphate, in addition to the granulated material previously turned out.

The run-of-pile triple superphosphate has a friable texture, being particularly designed for processors requiring a product with a high rate of ammoniation. It is also well suited for granulation into complete fertilizers. Special attention, the company reported, has been given to maintaining high phosphorus pentoxide content—46-48 per cent available phosphoric acid.

Both processing and storage facilities were added to the Bartow plant. To obtain the new product, the strength of phosphoric acid produced there is raised by evaporation to more than 54 per cent $P_2O_5$ from the 39 per cent used for the granulated material.

This higher strength acid is combined with ground phosphate rock in a TVA type cone mixer and the resulting slurry is solidified on a setting belt. After curing in the storage plant, the product is milled and screened prior to shipment.

The additional process does not raise the overall production total of the plant, which was originally rated at 200,000 tons annually of triple superphosphate, a figure which has been considerably exceeded in operation.

• • •

**Chase & Co.**, Sanford, are about ready with their new $250,000 plant which replaces the outgrown old plant there. Personnel will be moved into the new quarters which occupy a building 140 by 70 feet.

## IOWA

**Twin-State Engineering and Chemical Co.**, Davenport, has been formed with authorized capital of $25,000. Officers are Betty Raymond, president; Deloris Olsen vice-president, and Grace M. Lepard, treasurer.

## TENNESSEE

**Knoxville Fertilizer Co.** has developed a line of specialty fertilizers for plants and lawns. Produced at their three plants—Knoxville, Nashville and Johnson City—these goods will be marketed under the Knox Beauty brand.

## TEXAS

**Olin Mathieson** has made possible a 250 per cent capacity increase in sulfuric acid production by construction of a new facility adjacent to the Beaumont plant.

S. L. Nevins, corporation vice president, said additional construction is underway, which includes a new facility for the manufacture of ammonium sulfate.

The major part of the new facility is a 500-ton per day sulfuric acid plant. Previously, there were two 100-ton plants operating on sulfur.

Airplane view shows new run-of-pile triple superphosphate facilities at Bartow, Fla., plant of Davison Chemical Company Division of W. R. Grace & Co. which previously turned out only granulated triple superphosphate. New storage building is shown at extreme left; in back of it tower-like shipping facility. Conveyor belt extends to storage building from new processing section in the center.

# How to cut cake with a cube

TAKE a fern-shaped ammonium chloride crystal. Change its form to a cube, and you've cut fertilizer caking and bag-set in a hurry.

In fertilizers, ammonium chloride is formed during the mixing process by reactions between nitrogen materials and potassium chloride.

Ordinarily, it develops into fern-shaped crystals with hundreds of tiny, finger-like projections like those shown at right above. These crystals will cement fertilizer particles into a cake.

But now you can shape those crystals into non-caking cubes — and do it every time — with Sohiogen ammoniation solutions.

Sohiogen solution Nos. 10, 11, 15 and 16 are specially formulated with just the right amount of urea and ammonia with the ammonium nitrate to transform ammonium chloride crystals into square-edged, free-flowing cubes.

What's more, with these Sohiogen solutions, you finish three jobs at once. You solve costly conditioning problems, complete ammoniation and add supplemental nitrogen to meet grade.

So if caking is one of your problems, call the man from Sohio. He'll be glad to show you how Sohiogen improves formulation and cuts costs.

*We're serious about service at Sohio*

SOHIO

SOHIO CHEMICAL COMPANY

FT: AMANDA RD., P. O. BOX 628, LIMA, OHIO


Here is the container Diamond Fertilizer Co. of Sandusky, Ohio developed to launch their lawn and garden fertilizers into the grocery supermarket field. The 25-pound carton is designed to be sift-proof, and features a pouring spout as well as the double-thickness "easy-carry" handle.

The new facility is a sulfuric acid regeneration plant operating on raw materials from nearby oil refineries.

## WASHINGTON

**Central Chemical Co.** has begun construction at Wheeler of a plant whose equipment serves either for fertilizer or feed blending. Arthur Smith is general manager. Another such plant is under construction at Anaheim, California.

## WEST VIRGINIA

**Olin Mathieson** will shut down the plant at Morgantown they have leased from the Government, because of high operating cost. The plant produces ammonia and methanol.

## WISCONSIN

**American Agricultural Chemical** is establishing a plant in Johnson Creek which will employ some 40 people.

## BRAZIL

**The Japan Plant Association,** including Nobuhide Tsuda, will visit Brazil to explore the possibility of setting up a chemical fertilizer plant there. The visit is being made at the invitation of the Cotia Industrial Cooperative in Sao Paolo, which is planning several 50,000 annual metric ton plants. The Government is also planning to set up an ammonium sulphate plant with capacity of 100,000 annual metric tons.

## CANADA

**Electric Reduction Co., of Canada** has construction under way which will result in the first Canadian production of organic phosphates.

## MEXICO

**Guanos y Fertilizantes de Mexico, S.A.,** have recently contracted for the first triple superphosphate plant to be constructed in Mexico. The one hundred and fifty metric ton per day granular fertilizer plant, to be built near Coatzacoalcos, Veracruz, will be designed and engineered by Dorr-Oliver Incorporated and will employ the standard Dorrco Granular Fertilizer and Dorrco Strong Phosphoric Acid Processes.

Tentatively scheduled for startup early in 1960, the plant will be designed to permit doubling of the facilities at a later date and will use phosphate rock imported from Florida. This plant will be the latest of many Guanos y Fertilizantes chemical and fertilizer operations including amonia, single superphosphate and guano mine production installations throughout the Mexican states. Its construction is part of a Mexican government program designed to promote the growth of agriculture, one of the country's basic industries and to increase Mexican industrial independence.

Dorr-Oliver will supply the process and plant design, engineering and equipment for the phosphoric acid and final product manufacture sections and raw materials handling, loading and storage facilities. Contract arrangements also call for design, engineering and supervision of construction of yards, warehouse, maintenance, laboratory and cafeteria facilities; offices, guest house and other auxiliary buildings by Dorr-Oliver.

## HOLLAND

**The Albatros Superphosphate Factories** of Vlaardingen, awarded an engineering contract to The D. M. Weatherly Company of Atlanta, Georgia for a nitrophosphate plant. The plant will be built in Vlaardingen, and is the first to utilize the T.V.A. continuous rotary ammoniator for the production of nitrophosphate. Another unique feature of the plant will be the production of fertilizers containing 50% water soluble and 50% citrate soluble phosphates.

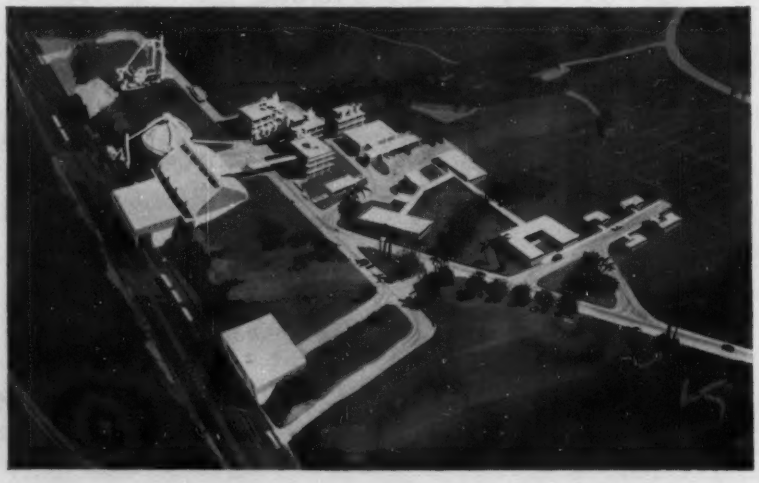
## HUNGARY

**Tisza's** big operation which was among other things to have turned out 280,00 annual tons of fertilizer has been delayed in construction.

## India Welcomes Private Capital

The Government of India has announced that fertilizer manufacture "in the private sector" is to be encouraged, and private capital invited to invest in plants, especially in Andrha, Rajsathan and perhaps elsewhere in the Bombay State. Investors are assured of repatriation of capital under an Investment Guaranty Agreement concluded between India and the U. S. Government.

Artist's rendering of the newly contracted Guanos y Fertilizantes de Mexico, S.A. triple superphosphate fertilizer plant to be built near Coatzacoalcos, Veracruz. Shown in the rendering at upper left is the sulfuric acid plant and sulphur and phosphate rock unloading and storage facilities. Open air industrial buildings near center are the phosphoric acid plant and triple superphosphate production section with storage building for the latter at left. Low buildings at right center are offices, laboratory, changehouse, cafeteria and guest houses. The 150 metric ton per day granular fertilizer plant is being designed and engineered by Dorr-Oliver Incorporated.



# changes

### Allied

Allied Chemical & Dye Corporation is planning a name change that will better reflect the broad nature of the company, and incidentally please headline writers in newspapers everywhere. Sent to the stockholders along with their proxy statements was a memo from Glen B. Millier, Allied president, asking a vote on this change and explaining that the new name in no way implies lack of interest in the dye business. The new name is Allied Chemical Corp. Allied has six operating divisions, which produce some 3000 products, at 120 plants with some 30,000 employees.

### Nitrogen Division

Allied's Nitrogen Division has reorganized its development department at Hopewell, effective last month according to word from Vice-President F. O. Agel, in charge of the Division's development activities. Dr. E. D. Crittenden, a pioneer in the nitrogen industry, moves up to the post of consultant to Mr. Agel.

"Three men have been appointed to the newly created positions of associate director, and they will be concerned with review and evaluation of the Department's program," Mr. Agel explained. The new associate directors are Dr. L. J. Beckham, formerly chief of ammonia research, Dr. C. K. Lawrence, formerly chief of organic research, and E. W. Bowen, formerly executive assistant to the vice president.

The reorganization also involves a realignment of responsibilities under which L. E. Dewling has been appointed director of process engineering; R. M. Jones, director of product development; Dr. H. L. Heckel, director of laboratories; Dr. G. J. Coli, director of operations engineering; and Carl Sampson, manager of construction.

"Mr. Dewling was formerly chief engineer. His new title is more descriptive of his duties and conforms to the standard nomenclature of Nitrogen Division," Mr. Angel noted.

Mr. Jones' headquarters will continue to be in New York. Dr. Heckel was formerly laboratory director; and Dr. Coli was formerly assistant principal chemical engineer. Mr. Sampson retains his former title but has been assigned increased responsibility.

The Development Department is responsible for Nitrogen Division's research, engineering and construction program.

### Niagara

Niagara Chemical Division of Food Machinery and Chemical Corp. has changed the name of its affiliate in Canada from Niagara Spray Co. to Niagara Brand Chemicals.

### Stauffer

Stauffer Chemical Company has leased additional office space at One East 47th Street, New York City as headquarters of the Northeast region staff on the agricultural chemicals division. The company's main offices remain at 380 Madison Avenue, New York City. The telephone number of the new offices will be the same as that of the main Stauffer office—Oxford 7-0600.

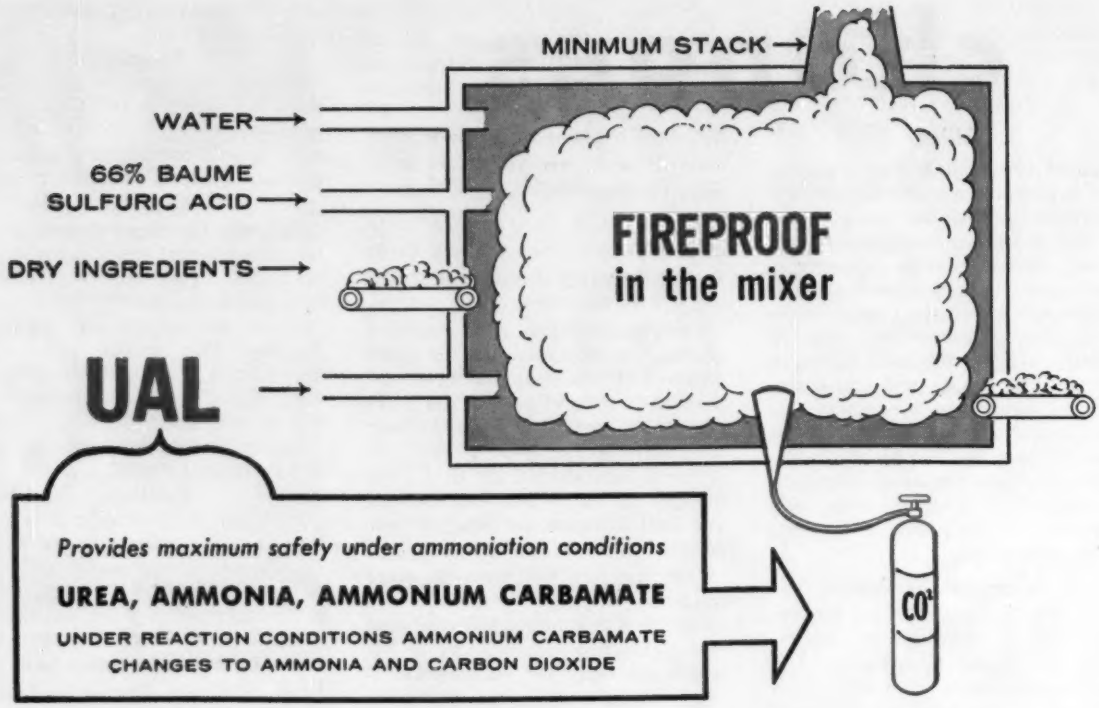
### Fertileze

Fertileze Co., formerly of Lexington, Ohio, has been acquired by interests in Memphis, Tenn., and moved to that city where operations are already under way. Fertileze is a formula developed by the late Louis Bromfield. Officers now are: F. S. Nicholas, president; Maurice W. Fink, vice-president; Abe Sauer, secretary-treasurer. They are operating in the 10,000 square feet of space at 2368 Prospect, Memphis.

### West Virginia P&P

Arrangements have been made for West Virginia Pulp and Paper Company to purchase two multiwall bag plants from Arkell and Smiths, one of the nation's pioneer bag manu-

This is the handsome, modern liquid fertilizer plant recently placed in operation by Farmers Liquid Fertilizer, Inc. at Patterson, Ark. (reported in our March issue). Behind the full-glass front is a 40 x 60 foot structure where upwards of 20 tons an hour of "Gro-Mor" liquid mixes can be processed in 5-ton batches, according to Paul F. Lovett, president and general manager of the firm. Designed by J. C. Carlile Corp. of Denver, the reactor unit can utilize TVA's new "superphosphoric" acid or wet-process acid as well as the usual 75% furnace-grade solution. FLF's converter will transform a 10,000-gallon tank car of anhydrous ammonia into aqua ammonia in 5 hours, or produce 20 tons of 8-24-0 ammonium phosphate solution per hour. Application and distribution equipment of latest design also was furnished by the Carlile Corp.




# Granulating is fireproof with Du Pont URAMON® Ammonia Liquors

Du Pont "Uramon" Ammonia Liquors give you maximum safety in high-temperature granulating by eliminating dangerous flash fires in the mixer; and, further, by assuring safety in the pile.

Fireproof conditions are maintained in the mixer when Du Pont UAL is used. As the ammoniation proceeds, the ammonium carbamate in UAL changes to ammonia and carbon dioxide. Ammonia enters the reaction and carbon dioxide displaces the air, thus creating conditions that guard against combustion.

Four formulations are available . . . all are equally safe for granulating. For technical assistance and information on the solution best suited to your use, write Du Pont.

**HERE ARE OTHER IMPORTANT ADVANTAGES OF DU PONT URAMON® AMMONIA LIQUORS:**

- High-quality nitrogen from UAL resists leaching . . . supplies both urea and ammonium forms of nitrogen.
- Won't corrode regular fertilizer manufacturing equipment, including ordinary steel and aluminum.
- Gives mixed goods better "feel"—minimizes caking, segregation and dusting.
- Suitable for either batch or continuous mixing.
- Prompt, dependable delivery enables you to schedule your production with confidence.

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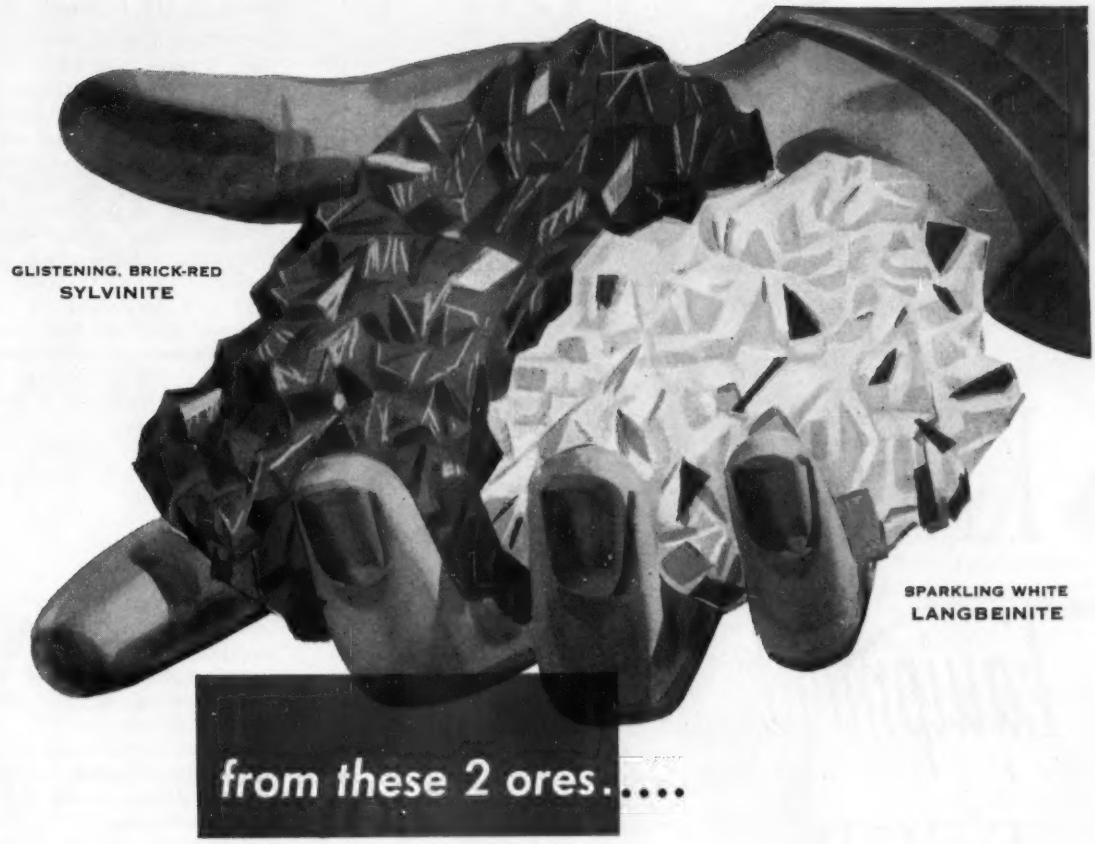


# 4 potash products for all your potash needs

**From SYLVINITE** . . . standard and granular muriate of potash.

**From LANGBEINITE** . . . SUL-PO-MAG® (double sulphate of potash-magnesia).

**From BOTH ORES** . . . sulphate of potash.

These two basic potassium ores can supply *your complete potash needs* for mixed fertilizers. After mining and refining, they are available in these four forms:

1. Standard 60% $K_2O$ Muriate of Potash for mixed fertilizers.
2. Granular 60% $K_2O$ Muriate of Potash for mixed fertilizers and direct application.
3. 50 to 52% $K_2O$ Sulphate of Potash for *premium* mixed fertilizers.
4. SUL-PO-MAG (22% $K_2O$—18% MgO)—premium potash and water-soluble magnesium for *premium* mixed fertilizers.

You can get *all four* of these products, for all your potash needs, from *one source* of supply. Other advantages: uniform quality in every pound; time-saving convenience in ordering and scheduling, and personalized sales and service from experienced people at your nearest district sales office:

ATLANTA, GA.— 1325 Fulton National Bank Bldg., M. S. Malone, *District Sales Manager.*

CHICAGO, ILL.— 20 North Wacker Drive, C. E. Martin, *District Sales Manager.*

NEW YORK, N. Y.— 485 Lexington Ave., W. W. Chadwick, *District Sales Manager.*

SHREVEPORT, LA.—418 Market St., J. K. Lindsey, *District Sales Manager.*

**POTASH DIVISION PRODUCTS:** For Agriculture—Sulphate of Potash, Muriate of Potash, Sul-Po-Mag,® Stock Salt. For Industry—Potassium Chloride, Sulphate of Potash, Muriate of Potash, Muriatic Acid, Caustic Potash, Carbonate of Potash, Liquid Chlorine, Magnesium Oxide. Mines at Carlsbad, New Mexico. Plants at Carlsbad, New Mexico, and Niagara Falls, New York.

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facturers, it was announced by officials of both companies.

Approved by the boards of both companies, the sale still is subject to approval by Arkell and Smiths' stockholders.

Although terms of the transaction were not disclosed, David L. Luke, president of West Virginia, said his company would pay cash for Arkell and Smiths' plants at Wellsburg, W. Va., and Mobile, Ala.

Sheldon S. Yates, president of Arkell and Smiths, pointed out that the transaction with West Virginia does not include the bag company's plants at Canajoharie, N. Y., and Hudson Falls, N. Y., which will continue to be operated by Arkell and Smiths. These plants will manufacture the same products as they have made in the past.

Mr. Luke said the two bag plants of Arkell and Smiths and the two plants of Fulton Bag and Products Company at New Orleans and St. Louis, acquired by West Virginia on April 1, would become components of a new Multiwall Bag Division of the paper company. Acquisition of these operations marks West Virginia's entry into the multiwall sack converting field, a major market for the company's new Clupak stretchable paper.

The two Arkell and Smiths plants being acquired by West Virginia will employ the present operating and sales organizations—a total of approximately 400 persons.

## French Fertilizer Matches Major Industries

The fertilizer industry in France, of recent years, has soared to new heights, and now is on a par in gross annual income with such leading industries as steel, electricity, gasoline. In 10 years French consumption has shown increases of 65% in nitrogen, 53% in phosphoric, 60% in potash.

## More Oats Than Canaries for Alaska

The cargo of the annual Spring fertilizer ship that sailed for Alaskan ports recently carried 115 pounds of canary seed, 36 tons of oat seed, 17 tons of pea seed, 4½ tons of grass seed. This seed was accompanied by 600 tons of mixed goods and fertilizer materials.

**There is no profit in a starved plant. Real profit comes only with good yields resulting from good farming practices.**

## UK and US Have Common Problems

Dr. Vincent Sauchelli, of NPFI, quotes Professor H. G. Sanders of the British Ministry of Agriculture, and then points out that we of the United States face the same situation. Prof. Sanders, major point: There is still a long way to go in the use of fertilizers before the law of diminishing returns really bites. A consumer survey, sponsored by NPFI and conducted by National Analysts, Inc., to find out what moves farmers to action comes up with the startling fact that much of the research information, developed at great expense, does not register with the farmer because it is not couched in terms he understands . . . the dollar value.

## Plants Have "Heart Attacks"

Tomatoes, cotton and other plants sometimes suffer "heart attacks" or "strokes," a University of Wisconsin researcher indicated at the 133rd national meeting of the American Chemical Society.

Fusarium fungi, which lurk in the soil, may invade the vascular system of a plant, Dr. Mark A. Stahmann, professor of bio-chemistry at the University, told the society's Division of Agricultural and Food Chemistry. Once in the plant's "blood vessels," the fungi produce an enzyme (accelerator of biochemical processes) that attacks some of the pectin in the vessel walls. Pectin fragments then get into the vascular stream, where they form gelatin-like masses that plug the conducting vessels—just as a clot blocks blood vessels to cause a heart attack or stroke in a human being.

Fortunately, certain varieties of the plants are not susceptible to these diseases, and it is therefore possible to develop resistant plant strains, said Dr. Stahmann.

## Dressed-up, Moss Now Sells Well

From Canada comes an interesting sidelight on the value of good packaging. Sphagnum peat moss producers formerly sold their product in bales—unsightly, almost impossible to merchandise. In fact the big U.S. gardener market was untouched. Came along the Canadian branch of St. Regis Paper, who applied to new packaging what they had learned in packaging fertilizers . . . and now sales are zooming. And the German competition is left far behind.

# HELP YOURSELF TO BIGGER PROFITS

**PHOSPHATE PRODUCTION**
No other process begins to compare with *way-ahead* Sackett SUPER FLO in making normal, fortified and triple super-phosphates of premium quality at *way lower* cost.

**MIXED GOODS MANUFACTURE**
Your investment in the latest Sackett Methods of producing conventional fertilizers is *guaranteed* to pay handsome returns. We are anxious to prove it.

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Step ahead of competition by entrusting your fertilizer expansion and modernization facility programs to our care. Many of the most forward-thinking fertilizer producers are glad they did.

**GRANULAR FERTILIZER**
Sackett Equipment leads the field in Granular Production.
The names of the fertilizer companies who have selected Sackett Granulating Processes above all others, read like a "Who's Who in Industry".

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Invest your dollars wisely by having Sackett build your new plant. We do the whole job . . . from the inception stage thru building construction and equipment fabrication to operating plant. See us for guaranteed results.

There is nothing that appeals to a man's reason more than plain facts. And, one plain fact is this . . . you can help yourself to bigger profits by resolving ***now*** to replace wasteful obsolete plant equipment with the latest rock-bottom cost methods as exemplified in Sackett Production Processes and Materials Handling Equipment. Why not start the ball rolling by writing or phoning us today?

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**Architects and *Manufacturing* Engineers to the Fertilizer Industry Since 1897.**

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# CF-Staff Tabulated TONNAGE REPORTS

FERTILIZER TONNAGE REPORT (in equivalent short tons) Compiled by Cooperating State Control Officials and Tabulated by COMMERCIAL FERTILIZER Staff

| STATE | March | | February | | Oct.-Dec. Qtr. | | January-June | | July-December | | YEAR (July-June) | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1958 | 1957 | 1957 | 1956 | 1957 | 1956 | 1957 | 1956 | 1957 | 1956 | 1956-57 | 1955-56 |
| Alabama | ------ | 196,033[1] | 46,709 | 74,943 | 96,046 | 101,280 | 808,900 | 872,550 | 172,721 | 174,623 | 983,607 | 1,042,416 |
| Arkansas | 48,121 | 74,693 | 19,342 | 33 045 | 17,829 | 26,759 | 265,265 | 299,172 | 62,752 | 59,915 | 325,150 | 359,471 |
| Georgia | 75,684 | 140,374 | 36,031 | 47,427 | 169,097 | 168,751 | 980,824 | 988,454 | 269,529 | 253,559 | 1,234,383 | 1,244,422 |
| Kentucky | ------ | 76,853[1] | 33,137 | 43,070 | 47,868 | 52,013 | 451,083 | 441,481 | 88,771 | 90,284 | 541,367 | 529,600 |
| Louisiana | 83,742 | 45,682 | 14,938 | 26,266 | 32,419 | 46,979 | 200,277 | 217,343 | 64,192 | 71,129 | 271,406 | 273,688 |
| Missouri | ------ | 141,780[1] | ------ | 50,189[1] | 142,402 | 154,331 | 460,487 | 444,230 | 335,312 | 331,343 | 791,830 | 800,471 |
| N. Carolina | ------ | 314,179[1] | 92,288 | 145,662 | 131,758 | 148,970 | 1,300,353 | 1,324,267 | 199,446 | 216,234 | 1,516,587 | 1,649,449 |
| Oklahoma | 9,903 | 15,308 | 6,147 | 8,877 | 21,604 | 29,343 | 52,836 | 65,854 | 51,436 | 54,509 | 107,345 | 135,396 |
| S. Carolina | 206,229 | 233,862 | 55,527 | 120,593 | 68,388 | 79,910 | 694,571 | 743,670 | 116,874 | 122,929 | 817,500 | 863,617 |
| Tennessee | 66,080 | 29,825 | 12,981 | 12,332 | 66,286 | 82,976 | 383.457 | 378,626 | 135,717 | 141,181 | 549,253 | 532,886 |
| Texas | 93,130 | 100,795 | 45,897 | 70,497 | 104,683 | 130,969 | 392,770 | 372,695 | 213,801 | 202,406 | 595,176 | 566,399 |
| California | (reports compiled quarterly) | | | | 225,490 | 231,361 | 663,484 | 639,377 | ------ | 412,747[1] | 1,079,748 | 1,001,554 |
| Virginia | (reports compiled quarterly) | | | | 66,405 | 78,509 | 600,158 | 599,111 | 140,784 | 154,075 | 754,223 | 761,820 |
| Indiana | (reports compiled semi-annually) | | | | | | 781,268 | 807,981 | 284,959 | 305,917 | 1,087,185 | 1,063,049 |
| Iowa | (reports compiled semi-annually) | | | | | | ------ | 315,329[1] | ------ | 85,147[1] | ------ | 445,329[1] |
| Michigan | (reports compiled semi-annually) | | | | | | ------ | 443,908[1] | ------ | 184,763[1] | ------ | * |
| New Hampshire | (reports compiled semi-annually) | | | | | | 15,730 | 13,168 | 3,966 | 3,253 | 18,983[1] | * |
| Washington | (reports compiled semi-annually) | | | | | | | | ------ | 55 709[1] | --- | 76,660[1] |
| Oregon | (report issued annually) | | | | | | 138,926 | 120,871 | 45,063 | 62,147 | 201,073[1] | * |
| TOTAL | 582,889 | 640,539 | 362,997 | 582,712 | 1,190,275 | 1,332,151 | 8,190,389 | 8,328,850 | 2,185,323 | 2,243,504 | 10,654,760 | 10,824,238 |

------(not yet reported) * Not compiled [1] Omitted from column total to allow comparison with some period of current year.

# MARKETS

**ORGANICS:** Demand for Organic fertilizer materials is currently quite strong, and spot purchasing of several popular Organic Ammoniates is quite difficult indeed, because of prior contract commitments of the producers. Leather Nitrogenous Tankage supplies are sold out for the next 2 or 3 months, and one major producer is completely sold out for the balance of 1958. Indicated price is $3.00 per unit of Ammonia for June-August, $3.25 September-December, and $3.50 January/forward, f.o.b. Midwestern shipping point in bulk.

**SEWAGE SLUDGE:** Two major producers of bulk Sewage Sludge at Chicago and Houston are currently fully committed on contract for the next couple of months at least. No change in prices is noted.

**CASTOR POMACE:** Supply position continues comfortable with Domestic material currently priced at $37.50 per ton in bags, f.o.b. Northeastern origin point. Imported Castor Pomace varies in price from $38.00 per ton to about $5.00 per unit of Ammonia, f.o.b. cars at certain Southeastern ports.

**DRIED BLOOD:** Unground sacked Blood in the Chicago area is recently indicated at $8.00/$8.25 per unit of Ammonia, and the New York market is around $6.50.

**POTASH:** Domestic Potash has been moving in heavier volume during recent weeks, but the general season's movement is behind schedule due to inclement weather. Two producers of Domestic Potash have announced price schedule for Muriate of Potash and Sulphate of Potash for the new season, with prices in one case fractionally higher than last season, and prices of the other, quite similar to the current season's prices.

**GROUND COTTON BUR ASH:** Interest in this special form of Potash, primarily in the form of Carbonate of Potash, in recent weeks has improved, and supplies are in good balance with demand. Delivered cost per unit $K_2O$ for most areas is somewhat lower to about the same as the delivered cost of Domestic Sulphate of Potash.

**SUPERPHOSPHATE:** Movement of triple Superphosphate and normal Superphosphate has advanced considerably as the season has become more active. Prices continue firm and unchanged.

**AMMONIUM NITRATE LIMESTONE:** Prices continue unchanged for Domestic and imported brands, but movement is considerably behind the same volume shipped to date last season, particularly in the Southeast.

**AMMONIUM NITRATE:** Movement in the Southeast for direct application purposes is considerably below levels for the same period last season; however, prices continue steady, and demand in the Midwest quite active.

**GENERAL:** Inclement weather continued to harass fertilizer manufacturers' movement of fertilizers to the farms, particularly in the Southeast, and totals of fertilizer moved to date are considerably below the volume moved during the same period last season. Manufacturers, however, expect rush business as the weather permits, provided there is not too great a delay in the arrival of favorable weather. Some contracting of raw materials for the new season has been done, particularly in the field of Organic Ammoniates. If present trends continue, supplies of Organic Ammoniates are expected to be short of demand for the new season.

## Weed Birth Control Ahead, Says Agronomist

R. S. Dunham, University of Minnesota says birth control rather than liquidation may be the future answer to weeds. He looks for chemicals to come which will either kill the seeds in the plant, or make them germinate in the fall, so winter will kill them.

midwest users
of agricultural

# NITROGEN

get three vital services from Texaco Lockport, Ill. plant

**1. Fast Delivery.** Lockport is located in the heart of the midwest, convenient to major rail, water and truck routes—and there is a brand new transport fleet to assure on-time deliveries.

**2. Ample Storage Facilities.** You have a dependable supply of agricultural ammonia—available when you need it, to meet your own schedules.

**3. Texaco Technical Service.** Experienced Texaco personnel are available to assist users of ammonia and nitrogen solutions to improve their operations.

And, of course, you're sure that the nitrogen solutions or agricultural ammonia you get from Texaco-Lockport will be absolutely pure and completely uniform, because Lockport's processing and handling equipment is *all new*.

TEXACO
PETROCHEMICALS

Call or write The Texas Company, *Petrochemical Sales Division*, 332 South Michigan Avenue, Chicago 4, Illinois, or 135 East 42nd Street, New York 17, N. Y.

# PEOPLE

## IN THE INDUSTRY

### Chapin

William J. Chapin, who for most of his 38 years with Swift & Co. has been active in plant food work, especially in sales, has been made head of their general feed department. From 1947 to 1952 he was manager of the Norfolk plant food plant, and more recently he has been head of sales in Southern plant food units and in charge of what was formerly the Plant Food Division, now the Agricultural Chemical Division.

### Stilwell

William M. Stilwell has been appointed by Climax Molybdenum to manage their agricultural sales and development.

### Wright

M. Steele Wright, Jr., has been elected president of Texas Farm Products Co., Nacogdoches, Texas, to succeed his father, who resigned after 22 years in that post and was made board chairman. Mr. Wright Sr. founded the company in 1930. Mr. Wright Jr. has been with the company since the beginning, and has worked in nearly every capacity.

### V-C

Virginia-Carolina has announced numerous personnel changes: Russell L. Haden, Jr. is vice-president; Richard E. McConnell is treasurer, succeeding Irving D. Dawes who retired after 27 years with the concern; Curtis B. Alderman has moved up to succeed Edward A. Sullivan, retired as credit manager after 45 years with the company. In the fertilizer manufacturing department, five have been reassigned with responsibility for these departments: C. A. Cox to sulphuric plants; C. E. Floyd to wet mix superphosphate; P. E. Stone to granulation; G. C. Burnett to dry mixing and shipping; F. C. Richter to plant engineering. These will hold staff rank, in advisory capacity to plant superintendents, and reporting to the general manager, C. T. Harding.

### Gay

W. L. Gay, vice-president of Berkshire Chemicals Inc., New York, in charge of the agricultural chemical department, retired on April 1st. He will remain with the company as a consultant.

### CSC

Two appointments as district managers for Commercial Solvents Corporation were announced by James V. O'Leary, general sales manager:

Walter A. Bauer was named manager of the Cleveland district office. Named to replace Mr. Bauer as manager of the St. Louis district office was Robert W. Breidenbach.

Mr. Bauer joined CSC in 1952. Mr. Breidenbach came to CSC in 1948.

### Cyanamid

Frank S. Washburn, general manager, agricultural division, American Cyanamid Company, has announced the appointments of Dr. J. T. Thurston, B. F. Bowman and G. L. Oppel to key posts in the division.

Dr. Thurston has been appointed technical director, Mr. Bowman marketing director and Mr. Oppel manager of manufacturing.

Cyanamid's Agricultural Division was created through the merger of the Farm and Home and Phosphates and Nitrogen Divisions.

### Monsanto

Monsanto Chemical Company's board of directors have elected John L. Gillis and T. M. Martin to the company's executive committee, Irving C. Smith a vice president; H. Harold Bible a vice president and general manager of the Lion Oil division; and E. J. Cunningham controller and director of Monsanto's accounting department.

Dr. David T. Mowry, St. Louis, has been appointed director of development for Monsanto's Research and Engineering Division. Dr. Mowry succeeds John J. Healy Jr., who has been appointed a member of the company's newly formed planning staff.

### Richardson

Three executive promotions were announced by Walter M. Young, director of sales, Richardson Scale Co.

John K. Rudd becomes manager, custom products division; William R. Runo becomes manager, standard products division; and Samuel M. Dix becomes manager, resale products division.

### Triggs

Appointment of Gene A. Triggs, former Union county agent, as director of the feed and fertilizer control division, State Department of Agriculture, has been announced by Si Corley, Mississippi agriculture commissioner.

Mr. Triggs succeeds W. J. Huffman, who is joining the U. S. Department of Agriculture in foreign service under the Point 4 program.

Raymond R. Hull has been appointed vice president of Dixon Chemical & Research, Inc., vice president of Dixon Chemical Industries, Inc. and general manager of the I. P. Thomas Division of Dixon Chemical Industries. He was formerly general manager of the I. P. Thomas Division when it was owned by Pennsalt Chemicals Corporation.

**Hull**

Paul J. La Marche has been made director of production for U. S. Industrial Chemicals Co., Division of National Distillers and Chemical Corporation, it has been announced by Robert H. Cornwell, vice president. Mr. La Marche will be located at the company's New York office; he joined National Distillers in 1949, and since 1951 he has been manager of their Ashtabula, Ohio plants.

**La Marche**

David L. Rawls has been appointed vice president in charge of sales of Dixon Chemical & Research, and Dixon Chemical Industries. He was formerly Director of Sales of Dixon Chemical & Research.

**Rawls**

Sinclair Chemicals, Inc., Corporation, has announced the appointment of Maurice E. Peterson as national accounts representative of the Nitrogen Products division.

In 1954 he entered business as partership-owner of S-P-S Plant Food Company, Onawa, Iowa, and in 1956 joined Sinclair.

**Peterson**

Bernard F. Nachtman has been named manger of the Chicago District office for Commercial Solvents Corporation, James V. O'Leary, general sales manager, has announced.

Nachtman

He joined CSC in 1947 as industrial chemicals salesman, and became manager of the Cleveland District office in 1951.

The Chicago District Office serves an area covering Northern Indiana and Illinois, Wisconsin, Iowa, Minnesota and the Dakotas.

Thomas J. Skeuse has been appointed vice president of operations of Dixon Chemical & Research, and Dixon Chemical Industries; he was formerly director of operations for Dixon Chemical & Research.

Skeuse

Daniel O. Walstad has been appointed a staff engineer, Agricultural Division, American Cyanamid Company, announced Frank A. Washburn, division general manager.

Walstad

In his new post Mr. Walstad will assume a number of duties which include liaison work in technical chemical sales, manufacturing and research on product development. He will be responsible for chemical aspects relating to product performance and advise on process and product quality problems.

Prior to joining Cyanamid, he headed the U.S. Army Chemical Corps Phosphates Development Works.

Sinclair Chemicals, Inc., has announced appointment of John J. Portz as sales representative, Nitrogen Products division. He will handle sales of Sinclair anhydrous ammonia and nitrogen solutions in the territory of Iowa, Minnesota, and certain areas in neighboring states.

Portz

### IM&C

International Minerals & Chemical has appointed Frank H. Gildner, Jr., as agricultural and sales promotion supervisor for its plant food division, and potash agricultural department. In his new position Mr. Gildner will specialize in advertising and sales promotion programs for fertilizers, concentrating on the agricultural industry.

Richard V. Falck is now district sales manager in the special products department of IM&C's phosphate chemicals division, with headquarters in Arlington, Texas.

The election of Jervis J. Babb, board chairman of Lever Brothers, and Vernon Taylor, Jr., Denver financier, to the board of directors of International Minerals & Chemical was announced by Louis Ware, IMC president.

### Manning

Appointment of Dr. Paul D. V. Manning as professor of chemical engineering at the California Institute of Technology becomes effective on July 1. He will retire on June 30 from his position as senior technical vice president, International Minerals & Chemical Corporation, Chicago, after 17 years service, in accordance with the company's retirement program. He joined International in 1941.

### Stauffer

The directors of Stauffer Chemical Company have accepted with regret the resignation of Christian de Dampierre as treasurer of the company. James W. Kettle has been appointed controller and treasurer to succeed him. Mr. Kettle joined Stauffer in 1954. Mr. de Dampierre will continue to serve as a director.

Other new officers were elected in addition to those presently serving. Among these: Archie Albright, assistant to president, was elected a vice president; James W. Kettle was elected treasurer and will continue to serve as controller; Carl Allen was elected an assistant secretary.

### Bemis

Ray Potter Perry, manager of the Bemis Visinet Mill in St. Louis, has been appointed manager of the Minneapolis plant and sales division of Bemis Bro. Bag Co. He succeeds O. M. Smith, manager at Minneapolis since 1952, who died suddenly last February 25.

Karl H. Hoffmann, Visinet Mill superintendent, has been named to succeed Mr. Perry as manager. Both announcements were made by Judson Bemis, executive vice-president of the company.

### McNutt & Sawhney

Appointment of Walter S. McNutt to the staff of The Connecticut Agricultural Experiment Station was recently announced by Neely Turner, vice director of the station. Dr. McNutt, a biochemist, will conduct research on the biochemistry of environmental effects on plants, in the Department of Soils and Climatology.

Vice Director Turner also announced that Brij L. Sawhney, who was born in India, has begun research as a member of the staff in soils and climatology.

### Fulton Bag

The board of directors of Fulton Bag & Cotton Mills, Atlanta, Georgia, has elected Joseph G. Shedd a vice president. Mr. Shedd's new title is vice president and general manager of manufacturing.

Appointment of Warren W. Danner as controller was announced by Charles H. Burns, Fulton's vice president in charge of finance.

He assumes controller responsibility for the mill division, bag division and corporate operations.

Robert E. "Bob" Akins has been appointed to the Chicago textile sales staff in an expansion move, Fred G. Barnet, vice president and general manager announced.

### Phillips

The appointment of J. Wayne Phillips, 31, as sales representative for Zonolite Company was announced by Robert A. Arnold, manager of the firm's Terra-Lite Division. He will cover Ohio, Western Pennsylvania, and West Virginia, serving golf courses, fertilizer and agricultural chemical companies, and garden supply outlets.

### Dorr-Oliver

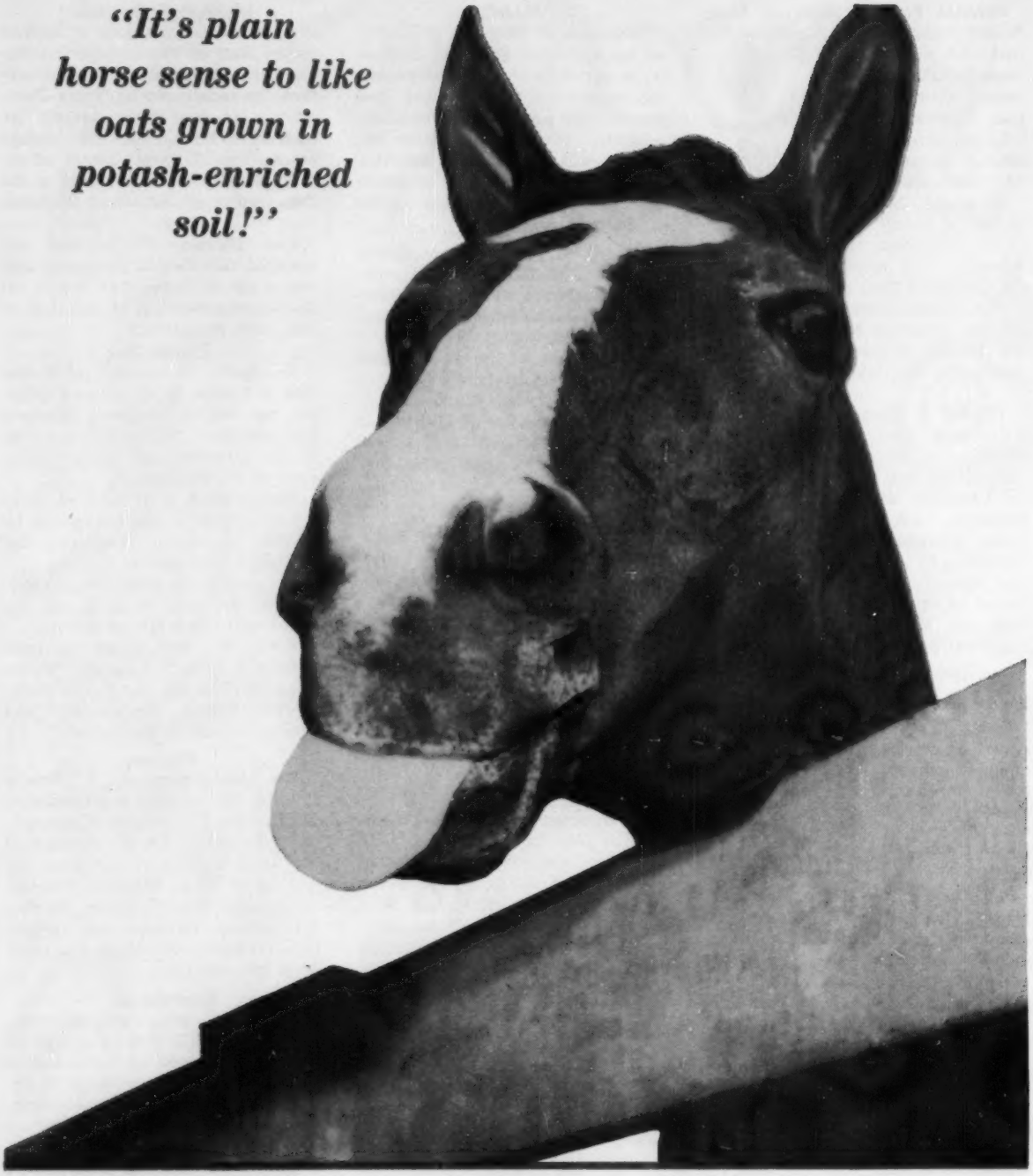
Dorr-Oliver announces the election of William J. Fox as vice president for the field of technological growth and the appointment of Dr. Elliot J. Roberts as company technical advisor. Creation of these two new top level posts are the first steps of a research and development reorganization and realignment brought about by recognition of the increasing importance of research and development to the company's future.

It is designed to free top research staff from administrative duties.

## OBITUARIES

**William G. Duncan,** 63, president of Duncan, Dieckman & Duncan Mining Co., died March 16 at St. Louis, of a heart attack.

*"It's plain horse sense to like oats grown in potash-enriched soil!"*



**FERTILIZER MANUFACTURERS**—The United States Potash Company offers three outstanding grades of potash. Higran and Higrade muriate (both white, both with 62/63% $K_2O$), the purest agricultural muriates now available. USP also produces Granular muriate of potash (pink-red), containing 60% $K_2O$. All three grades are non-caking and free-flowing throughout.

Our Technical Service Department welcomes your inquiries.

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# TVA CONSIDERS BROADENING CONFERENCE, INCLUDE INDUSTRY

The annual conference on Agricultural Economics Research Activities drew more than a hundred prominent agricultural economists, soil scientists and agronomists from 13 states to Knoxville, Tenn., March 25-27.

Attendance at the seminars, sponsored by Tennessee Valley Authority's Division of Agricultural Relations, has been restricted generally to representatives of land grant colleges participating in the TVA research activities, who were brought together annually to develop common methods and to report on the progress of their research activities relating to fertilizer marketing and many other factors affecting it.

Consideration is being given, however, to expanding future seminars, allowing the fertilizer industry to send sales and marketing men to the conference, where they can get firsthand the benefit of the many studies that will have an influence on their sales graphs.

This year's jampacked three-day program brought forth dozens of reports from educators whose names are familiar to fertilizer men everywhere. Many of these dealt with methodology and theory, and it will be several seasons before they bear fruit for the fertilizer salesman's basket. Others, however, dealt in terms and problems that are a familiar part of the fertilizer industry.

Present plans are to lighten and simplify future programs in such a way that they will give the industry something tangible and immediate to use in sales planning and selling. E. L. Baum, chief of the agricultural economics branch of TVA's division of agricultural relations, says he feels the groundwork has been laid and much of the continuing research has progressed to the point that the agenda can be geared to the industry's immediate needs beginning with the 1959 seminars.

## NPFI Corn Club Contest

Washington State got off to a good start on a five-acre Corn Club recently when initial committee meetings were held to set up a contest in the irrigated corn area in the state. Sponsored by the State Extension Service and the National Plant Food Institute, preliminary meetings were held in Moses Lake, Othella, Yakima, Pasco, and Prosser. Attending the meetings were interested people from the chambers of commerce, banks, Kiwanis, fertilizer and seed dealers, corn seed companies, and other groups. County agents in each area outlined the purposes of the club.

It was noted that approximately 19,000,000 bushels of corn were shipped into Washington in 1956, which could have been grown to advantage locally on 200,000 acres of land in the irrigated area. Many of the bankers present emphasized the fact that corn production could be an important stabilizing effect in agriculture in the area and lend itself to a well-rounded agricultural program.

Yields per acre of field corn in the irrigated areas of Washington have averaged about 80 bushels per acre. It was the unanimous opinion of the local corn committees that by stimulating the proper use of fertilizer, seed, and other management practices through the corn club program that this average could be raised to 100 bushels per acre in a very short time.

## Illinois & Wisconsin Crop Charts from NPFI

Crop production potential wall charts for Illinois and Wisconsin have been published by the National Plant Food Institute's Midwest regional office for distribution by Institute member companies.

Check lists, which carry specific information relating to the various major soils areas in each State, presently are being printed.

The Midwest office expects to circulate sample copies of the posters and check lists to member companies within a few weeks. The wall charts, either folded or flat, and the check lists will be available to members at NPFI's reproduction cost. Selling prices are 35¢ each and $20 per thousand, respectively, for the posters and check lists. Arrangements by member companies for imprinting the wall charts or check lists can be made through the Midwest office. However, imprinting orders should be in quantities of 1,000 or more.

The charts and check lists were prepared in cooperation with soils and crop scientists of the University of Illinois and the University of Wisconsin.

**Top:** Floyd Truesdell (center), University of Kentucky agronomy student, holds the National Plant Food Institute Agronomy Achievement Award plaque which was presented recently by W. Morris Newman, (right), vice president, Price Chemical Company, Louisville, Ky. Dr. Gilbert Webster, head of the Department of Agronomy looks on. Truesdell received a scholarship for $200 and an engraved key, while the plaque, which is inscribed with his name, remains on display at the University.
**Below:** Allan L. Seim (center), student at Iowa State College, another 1958 winner of the Award, and a cash prize of $200.00. The selecting committee was composed of major staff members in the Iowa State Department of Agronomy plus the executive officers of the Student Section, American Society of Agronomy. The award recently was presented by Dr. W. H. Pierre (far right), Head of the Agronomy Department at Iowa State and Zenas H. Beers, Midwest Regional Director of the National Plant Food Institute.

## NPFI Survey On Western Farms

Western farmers who use commercial fertilizers at or near the levels as recommended by their state agricultural colleges have higher incomes, and make more money per acre, than do their brothers who do not make proper use of fertilizer, according to the recent NPFI survey to determine farmers attitudes toward the use of fertilizer in that area. Among other things, this report shows that:

The high-level fertilizer user — **is younger**—45 percent are under 40 years of age . . . **has a better education**—76 percent have attended high school and 44 percent have at least some college training. . . **has a higher income**—91 percent reported gross incomes of $10,000.00 or more. . . . **more frequently uses irrigation** — 96 percent of high users irrigate. . . . **has bigger capital investment** — 95 percent or more reported, capital investments over $35,000.00. . . . **makes more money per acre**—an average of $121.00 per acre gross income.

# THE ROLE OF

# AGRO-ECONOMIC RESEARCH

## IN SOIL FERTILITY PROGRAM

*by* J. W. Fitts*
*Soils Department, N. C. State College*

Research in general may be divided into three categories: (1) Applied or that which has direct application to a current problem; (2) Basic research on an applied research problem; and (3) Basic research with no immediate application as an objective. One of the first questions often asked about a research project is, "What is its value?" or "What is its application?". This is especially true in the field of Agriculture where the greatest emphasis has been placed upon categories (1) and (2). Such philosophy prescribes a cooperative endeavor in Agronomy and Agricultural Economics in answering the question, "Under what conditions will the use of commercial fertilizers pay?".

A tremendous amount of research has been done in the past on the subject of soil fertility, and an even greater amount will be done in the future. One of the first questions was in regard to the elements essential for plant growth. Next, which of these essential elements are obtained from the soil, and in what forms do plants assimilate them? After this basic information has been obtained, the problem is then encountered on how to apply the essential elements in a manner which will result in greatest economic return.

It is a common practice among Soil Scientists to characterize soil series as being adapted or not adapted to production of certain crops. For example, a Norfolk sandy loam soil is said to be an excellent flue-cured tobacco soil, but a Lakeland sand is likely to be too droughty. In actuality both soils may produce good quality of flue-cured tobacco, but the management practices must be different. The Lakeland sand may need irrigation which, if not too expensive, will permit economic production of tobacco. It is the responsibility of the Agronomist to ascertain the practices that will be needed to produce the tobacco crop. The Agricultural Economist must then determine the feasibility of the practices available.

All states have soil testing laboratories, and almost all states make general fertilizer recommendations. In both instances, the recommendations are for so many pounds of $N$-$P_2O_5$-$K_2O$ or a certain fertilizer grade for the crop in question. Actually the fertilizer is applied to the soil and not to the crop. We test the soil to find out the relative availability of some of the essential nutrient elements, and then we add fertilizer to the soil to boost crop yields. Only a portion of the fertilizer applied will be taken up by the plants; the remainder may be lost by leaching, or it may be converted to another form in the soil. Soil factors that must be considered relative to the uptake of elements include: Kind and amount of clay and organic matter, soil acidity, exchangeable cations, depth of profile, and physical properties that influence movement and storage of moisture, aeration and temperature. The amount of fertilizer recommended for a given crop frequently is based on the possible returns from the crop rather than the soil characteristics. A high return crop, like flue-cured tobacco or truck crops, will receive a much higher fertilizer recommendation than a low return crop, such as grass and clover, on the same soil. This, of course, is an economic consideration, but are we giving as much emphasis to the soil characteristics as we should in making the fertilizer recommendations?

Agronomic-Economic research today is much like soil testing research of a few years past. The data available on soil fertility, generally, has not been of the type suitable for economic studies. In many of the studies, the factors influence response from fertility, including nutrient levels of the soil, have been considered as independent variables. Efforts have been made to control all variables but one—usually a certain element such as Nitrogen. The addition of one element to the soil may influence the availability of another. Heavy applications of Nitrogen may influence the uptake of Phosphorus. This may be a direct effect or an indirect effect by its influence upon soil micro-organisms.

The Cubical design has given us a new tool—a good tool which permits the study of several factors at one time. We can study N, P and K at varying rates in one experiment without an unwieldly number of plots. These studies permit the development of economic response surfaces for the three major elements when applied at various rates. It also permits a study of soil factors affecting the availability of these nutrient elements at different rates of application.

Although his study has given us some very valuable information and has been the basis for several side experiments, we have really only touched the surface. Much will still come from the mountain of data collected during the past three years in our study. The results have already shown us where more information is needed. One big question is the residual effect of the fertilizers applied. Soil factors will greatly influence the results. It is very important that we know how much fertilizer and lime should be applied initially to a soil for a given cropping system, and how much should be applied annually thereafter. This field of study should be approached by a cooperative endeavor between the Agronomist and Economist.

* Presented at the TVA Conference March 25-27.

# SAI RESEARCH PROVES OUT VALUE OF TRACE MINERALS

Trace mineral fertilization may be a vital factor in the establishment of new forage crops in south Texas and the resultant increase in crop yield and quality can be of great importance to the cattle industry.

On a basis of four years research findings, scientists of Southwest Agricultural Institute (SAI), San Antonio, point to the soil building program as an economic boon to the southwest.

Studies, nursery tests, and actual field testing have been carried out with the cooperation of the Coastal Bend Field Station, Taft, Texas, the Santa Gertrudis Division of the King Ranch, near Kingsville, and the Pel Star Cattle Co., Los Fresnos, in a fertilizer research program supported, in part, by the Calumet and Hecla, Inc., the Climax Molybdenum Co., and the American Zinc and Lead Smelting Co.

The application of phosphate to crops including soybeans, mung beans, guar, alfalfa, bur clover, milo and sesbania consistently increased crop yields but the inclusion of the trace minerals of copper, molybdenum and zinc increased the yields over and above that of phosphate fertilization alone.

"The degree of response varied with the type and variety of crop and the sources of the trace element," Dr. C. L. Shrewsbury, acting director of the Southwest Agricultural Institute, points out.

On a test plot near Brownsville, for example, bur clover fertilized with phosphate alone yielded a fresh weight of 14,851 pounds to the acre; a fertilizer containing phosphate and molybdenum yielded a fresh weight of 15,920 pounds to the acre; whereas the use of phosphate, molybdenum, copper and zinc gave a yield of 17,963 pounds to the acre compared with 12,934 pounds per acre from unfertilized land.

In a program completed recently near Taft, fertilizer containing phosphate alone brought about a 16% increase in soybean forage over an untreated plot. Yields of treatments containing phosphate and one minor element ranged from 10.9% to 40% greater than untreated. Yields containing phosphate, molybdenum and one of the minor elements ranged from 13.1% to 46% increase over the untreated plot while treatments containing phosphate, molybdenum, copper and zinc brought about a 38.4% increase over the untreated plot and an increase of 20% more than that of phosphate alone.

Dr. Shrewsbury points out that the research program will be continued at an accelerated pace in an effort to help farmers and ranchers increase legume and forage production in the southwest.

# research briefs

**Sawdust** plus other kinds of waste, such as comes from slaughterhouses, breweries and the like, may one day make a sound soil additive, if the University of Washington has its druthers. This will please us. Long have we grieved over the waste pile of lumber mills!

♦

**Plant tranquillizer** developed by U.S. Rubber has the effect of protecting the crop against the effects of shock and stress, such as heat spells, cold spells, too much rain or too little. Thus Duraset-20W, as it has been named, will increase plant yields. Field tests have demonstrated that it works on a wide variety of crops, and application costs are small compared to increased yield.

♦

**Corrosion**-preventive liquids added to liquid fertilizer solutions to—among other things—protect the application equipment, will be tested this summer for their effect on the soil and the yield.

♦

**N Loss** during bagged storage of mixed fertilizers is not significant, according to research by USDA.

♦

**Tree barks** make bigger and better orchids and other plants, according to the New England Council. It seems the Brown Co., a paper concern, has found certain types of bark, formerly waste, make a good base for fertilizers when pulverized. The Brown people are located at Berlin, N.H.

♦

**Rice** is a major problem to researchers because there are some 7000 varieties, which respond variously to geography, soil, fertilizer et al.

♦

**Companion** crop technics work. When oats are used as a companion to legume-grass mixtures, higher forage yields result next year. The practice, according to the University of Minnesota, gives the legumes a better chance to develop the first year, best when the companion crop is cut for hay.

♦

**Experiments** which have been conducted at the Delta Branch Experiment station, Stoneville, indicate that commercial production of yellow popcorn hybrids can be successfully grown in northern counties of the Mississippi Delta. The experiments were started in 1952. None of the white hybrids proved satisfactory for Mississippi production. A complete and detailed report of the popcorn research is available in the March issue of Mississippi Farm Research, Experiment Station, State College, Miss.

## Du Pont Announces School Grants

Grants totaling more than $50,000 for applied research on agricultural applications of high-content nitrogen compounds have been awarded to 16 universities and colleges for 1958, it has been announced by Du Pont's Polychemicals Department.

The funds have been specifically allocated to schools with major agricultural research units that normally conduct extensive programs in the fields of turf and ornamentals fertilization, and animal feeds.

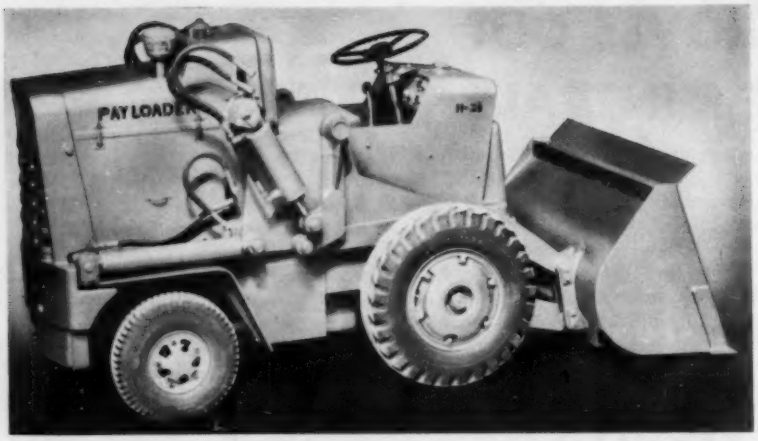
The grants are in addition to Du Pont's annual program of aid-to-education.

## ICA Grant To Mississippi State

An $18,000 grant for seed study has been awarded Mississippi State College by the International Cooperation Administration. As a result, farmers in underdeveloped areas all over the world will have an opportunity to learn of new improved methods of seed technology.

The grant to Mississippi State is to provide advisory, instructional and research services to improve the quality of seed being produced and planted in countries receiving ICA aid. The contract is for a nine-month period, renewable at the date of expiration.

Hunter Andrews, who will receive his master's degree in June has been employed by the Mississippi Agricultural Experiment Station to serve in a liaison capacity between the Mississippi Seed Technology Laboratory, located on the campus, and the technical aid missions in each of the foreign countries.




# *Hough's New 'Payloader' Hikes Capacity, Ease*

The Frank G. Hough Co. has announced production of an entirely new "Payloader" model, the H-25. It is their first rubber-tired, front-end loader with a rated carrying capacity of 2,500 lbs. A combination of numerous new design features is expected to establish new standards of production and ease of operation according to the manufacturer.

Although this new H-25 "Payloader" has more capacity and is larger and heavier, it can be operated in and out of boxcars having 6-foot doors. It actually has a shorter turning radius—6 feet to the outside rear hub—than any other rubber-tired tractor-shovel. Power-steering as a standard feature assists both maneuverability and ease of handling.

A new power-shift transmission and new torque-converter are matched to provide the maximum in speed of movement and ease of operation. The power-shift transmission is full-reversing and has two speeds.

Another feature of the power-train of the new H-25 is the power-transfer differential which automatically transfers more torque to the drive wheel with the best footing when slippage is encountered. The large-diameter hydraulic brakes have an automatic adjustment and are sealed against dust, dirt and solid foreign material. An access panel at the front of the machine makes it easy to inspect and service the master brake cylinder.

This new unit is being offered with a choice of gasoline, diesel or LPG (liquified petroleum gas) power. The 44 h.p. gasoline engine is equipped with wet sleeve cylinder liners for easier maintenance and the overhead valve design provides greater efficiency.

For handling of dense, compacted materials, the H-25 has a breakout force of 4,500 lbs. and, like other "Payloader" front-end loaders, provides a bucket tip-back of 40 degrees at ground level, which permits loads to be carried lower and closer to the machine for stability and better balance.

Maximum dumping height clearance (5 feet 4½ inches) is 6½ inches higher than the average of other loaders now being offered in this general capacity range.

Operators concerned with dust and dirt problems will be interested in protective features of the H-25. The engine is afforded maximum protection with a triple air-cleaning system. The filtered hydraulic system features replaceable oil-filter cartridge and the oil reservoir is a closed, pressure-control type, electrically welded. Sealing of the majority of all pivot points reduces maintenance. Both transmission and torque-converter oil is cooled by the engine radiator cooling system.

The H-25 fuel tank has sufficient capacity to permit a full eight-hour operation, eliminating need for refueling during any shift.

With a carry-capacity of 2,500 lbs., this new "Payloader" can handle a maximum load of material weighing as much as 125 lbs. per cubic foot using a bucket with an SAE rated capacity of 20 cubic feet. Several buckets in various sizes are offered in order that the average weight of the material to be handled can be matched to the carry-capacity of the unit.

The H-25 is equipped with a 12-volt electrical system and, in addition to the usual standard gages, is equipped with an Hourmeter.

In announcing the H-25, Hough disclosed that they will continue to manufacture the Model HA which has 2,000 lbs. carrying capacity. Recently the 10,000th model HA was produced.

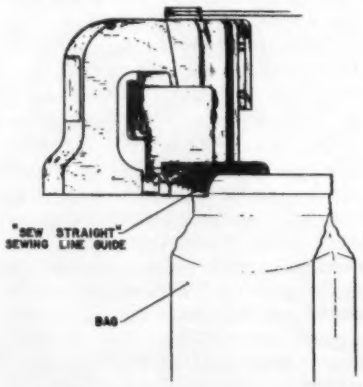
Descriptive literature and detailed specifications on the Model H-25 may be obtained by writing to The Frank G. Hough Co., 702 Seventh Avenue, Libertyville, Illinois.

## Sewing-Line Guide From Union Bag-Camp

Users of open-mouth multiwall bags will be interested in a new sewing line guide developed by Union Bag-Camp Paper Corporation. Called "Sew-Straight," the guide insures a constant, uniform sewn top closure and improves the appearance of the package.

The fact that the guide makes it possible to sew a straight line closure within one inch of the bag top is another important advantage. This elevation of the sewing line improves bag performance by incresing its available capacity. Where users have bought extra length bags to make it easier to effect a uniform sewn closure, use of the sewing line guide can also reduce overall bag length, thus reducing bag costs.

The sewing line guide is used in conjunction with an "E" type sewing head and does not reduce operating efficiency; speeds in excess of 20 50-lb. sewn multiwall bags per minute have been recorded in actual commercial tests with this sewing line guide.




**The 80% of farms that are family-size produce 75% of all farm products sold.**

## New Bag Checkweigher Offered by Exact Weight

Exact Weight Scale Company, has announced a new automatic case and bag checkweigher, designated as the Selectrol Model 1250. The machine is offered for weighing cases, cartons and bags from 20 lbs. up to 100 lbs. Accuracy is one-tenth-of-one-percent on products weighing 20 to 100 pounds. Speeds up to 30 products per minute are obtainable. The speeds and accuracies may vary in accordance with production rate, product dimensions and accuracy required.

Designed for installation in a production line, it weighs cases or bags in motion. Cases may be open or sealed; bags must be sealed and lying down on the conveyor, usually with the long dimension parallel to conveyor travel. Powered intake and weigh conveyors are utilized. Control system uses either differential transformer or photo-electric transducer depending on application, and the recording and control requirements.

The Selectrol is of rugged mechanical design and utilizes proven 1 to 1 ratio lever principle, with electrical parts protected in gasketed housing built to NEMA 12 requirements (oil and dust tight).

The Selectrol 1250 is shown with the rejector mechanism. It may be supplied with underweight rejection only or underweight and overweight rejection thru the same reject channel. Correct, acceptable weights continue on in a straight line.

It is also available without the rejection mechanism, with only electrical underweight and overweight signal output.

Literature or detailed specifications are available from The Exact Weight Scale Co., 538 E. Town St., Columbus 15, Ohio.

## Chain Belt Issues Bulletin

A new bulletin describing the Rex-Rated Standard Industrial Bucket Elevator line has just been released by Chain Belt Company, describing the complete line of Rex Industrial Elevators. One of its most useful features is the inclusion of simplified selection data which makes the proper choice of this equipment a quick and easy matter.

For a free copy of this bulletin, write Chain Belt Company, Dept. PR, Milwaukee 1, Wisconsin.

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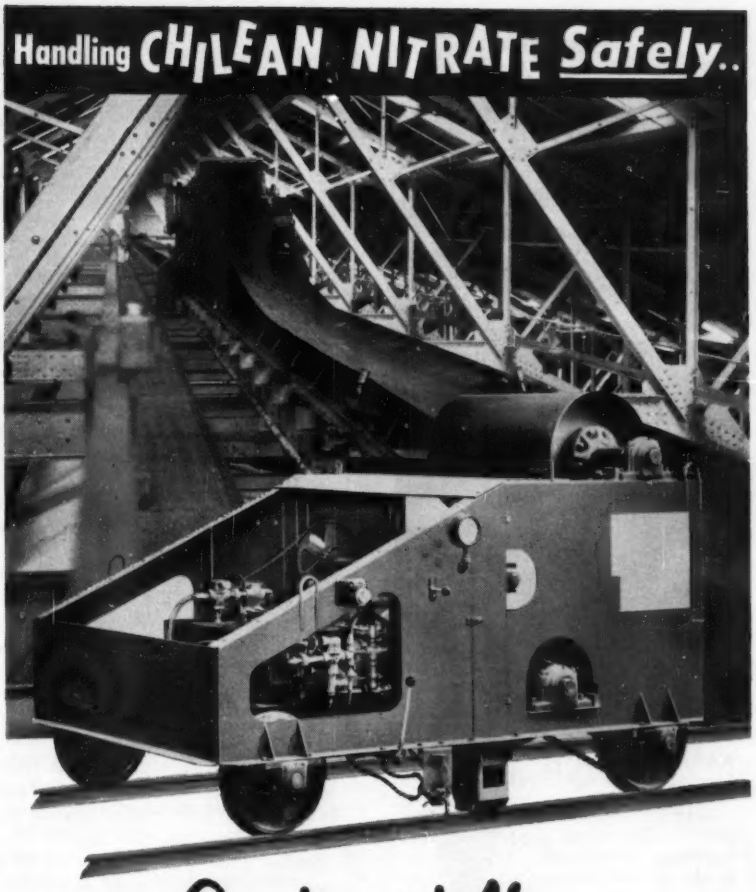
**About one-eighth of all US crop production depends totally or in part on irrigation.**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**Hydraulic Tripper**

For handling explosive and/or hygroscopic materials, Continental's Patented Hydraulic Tripper offers unique advantages —

- The unit is belt-powered through a hydraulic motor to the tripper wheels.
- Equipped with hydraulic controls throughout.
- Fully enclosed hydraulic system.
- No electric trolley wires — no cable reels — with resultant explosion hazards and extra maintenance.
- No clutches or friction drives to corrode during down time.
- Hydraulically-operated spring-set brakes provide tripper positioning without creep, crawl, or accidental release.

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INDUSTRIAL DIVISION

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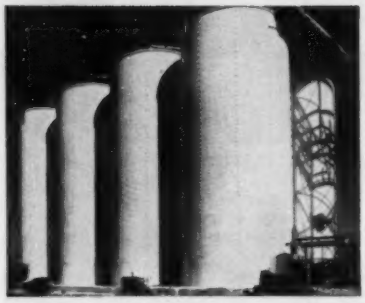
**SAVE**
with a MARIETTA STORAGE SYSTEM Engineered to your own needs



MARIETTA STORAGE SILOS can be erected in any number of units for bulk storage.

● You'll realize a big savings in time, money and materials when you install a modern Marietta Storage System.

Sturdy, interlocking concrete stave silos save materials by keeping them dry, free from waste, protected against weather or fire. And there's practically no maintenance to Marietta storage silos.

Conveyors, feeders, discharge systems or other specially designed equipment save material handling time and speed-up your operation. Whatever bulk material you use, you can depend on Marietta's know-how to design and erect the most efficient system for your need. The complete job will be handled under one cost-saving contract or in cooperation with your engineering staff, consultants or contractor.

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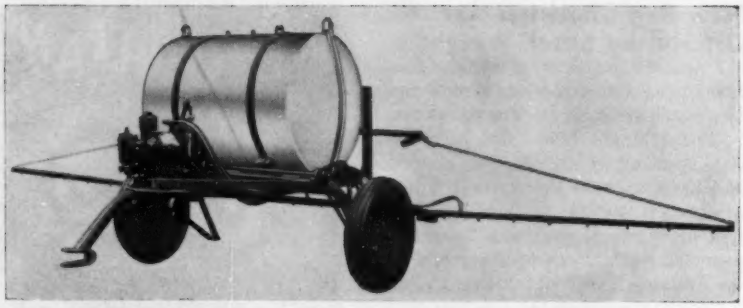

# General Metals' New Applicator

General Metals, Inc., manufacturers of a complete line of equipment for nitrogen solutions and liquid fertilizers, have developed a new trailer applicator.

Their Trailer Applicator Model TPD-200 is made for efficient, economical top-dressing of nitrogen solutions or complete liquid fertilizers. This unit is ideal for fertilizing pastures, small grain or row crops. Very fast coverage is obtained due to the large area that can be covered on a single pass by the long boom. Solutions can be accurately applied on 150-200 acres per day under good conditions. These trailer units have been field tested for over a year and have proven to be outstanding for liquid fertilizer application.

Trailer TPD-200 consists of a heavy-duty trailer, large aluminum tank, accurate metering pump and all-steel boom. General Metals trailers are designed to be pleasing to the eye as well as rugged to stand up under the severest field and road conditions, since rugged construction will mean less maintenance work and keeps the trailer in the field even under the toughest conditions.

Arched axle design of the General Metals Trailer absorbs shock and abuse and assures adequate clearance for all crops. Heavy bracing adds to the tubular design to give unusual strength. Wheels are equipped with Timken roller bearings. All models are equipped with non-tilt supports which prevent tipping of the trailer and loss of solutions or damage to tank or trailer.

Metering pumps furnished on Applicator TPD-200 feature "Dial the Rate of Application," and handle types of farm chemicals. The customer is given a choice of Model N Pump for complete fertilizers or Model S Pump for nitrogen solutions. A major advantage of the Model S & N Pump is the ease and simplicity of the dial setting of the metering stroke. The dial can be quickly set to any of 14 positions and a large number of intermediate positions. The pump is driven from the ground wheel of the trailer by roller chain, affording accuracy at all speeds. Smooth, quiet operation of the pump is due to the positive drive crankshaft and eccentric running in a bath of oil and acuating a piston. The double-acting design eliminates pounding and jerking and gives longer pump life.

On Trailer TPD-200, the customer is given a choice of 235 gallon pressure or 210 gallon non-pressure tank of aluminum, steel or stainless steel. The ends of the pressure tanks are flanged and dished for maximum strength in accordance with A. S. M. E. specifications for unfired pressure vessels to 30 p.s.i. working pressure. North Carolina approved measuring gauges are on each end of the tank. The tanks are equipped with the best in fittings and safety features.

The General Metals boom is built of heavy-duty angle iron, designed to stand up under roughest field use. Steel angle backbone eliminates costly repairs often necessary on aluminum and plastic booms. The standard 21-foot boom is made in three 7-foot sections. Boom extensions and longer booms are available. Neoprene hose runs from pump to each boom section and between fittings for entire length of boom. Mounting brackets for the boom are adjustable to any practical height. The three boom sections are connected by 4-way, spring-tensioned hinges. These hinges permit the boom to swing up, down, forward or backward, to avoid damage when striking obstructions. The 24 nozzles are spaced at 10½" intervals. The nozzles can be quickly changed from one type to another. A wide choice of spray nozzles is available.

A complete description and pictures of the TPD-200 Trailer are given in a bulletin just published. Copies of Bulletin N-CF may be obtained by writing Charles G. Monnett, Sales Manager, General Metals, Inc., 858 Goldsboro Street, Greensboro.

## IM&C Ships Record Load

The Midwest's great farm belt received this spring the largest single-owner shipment of plant food ever to come up the Mississippi River.

About 10,000 tons of phosphate materials valued at almost half a million dollars was in the eight-barge tow which left Baton Rouge in mid-March.

This record shipment by International Minerals & Chemical Corporation, Chicago, consisted of both triple-super phosphate and rock phosphate from its Bartow, Fla., operations.

## Monsanto Pamphlets on Corn, Cotton, Lime

Three pamphlets designed to help farmers realize higher yields per acre are available free from Monsanto Chemical Company's inorganic chemicals division.

Two of the pamphlets are devoted to the correct fertilization of corn and cotton, respectively; the third points out the advantages of applying lime to fields in order to increase crop yields and help fertilizers do their most efficient work.

Pamphlets can be obtained by fertilizer dealers who write to Monsanto's Inorganic Chemicals Division, St. Louis, Mo.

## New Heavy-duty Screen From Link-Belt

A new heavy-duty Straightline horizontal vibrating screen, CL-Model 58, has just been announced by Link-Belt Company.

The new, low-head-room, horizontal vibrating screen achieves a high intensity motion by centrifugal force, unbalanced shaft vibrators. Two eccentric shafts in the vibrator, supported by heavy duty oversize self-aligning bearings, are rotated by a helical gear speed reducer, giving the screen its straightline motion which is so effective in a wide variety of screening applications.

For easy mantenance the screen decks are bolted to side plates. When a deck is worn and has to be replaced, it can be removed simply without the trouble of taking out the entire screen frame.

Straightline CL-Model 58 vibrating screens are made with single or double decks in 15 sizes ranging from 4 by 8 ft. to 6 by 16 ft. All Link-Belt Straightline screens are also equipped with a snubbing device that limits motion during acceleration and deceleration and automatically eliminates critical vibration in the resonance speed range.

Additional information can be had by contacting your local Link-Belt district sales office or by writing to Link-Belt Company, Dept. PR, Prudential Plaza, Chicago 1, Ill.

## New Fertilizer Formulation Announced by Du Pont

A new formulation of "Uramite" fertilizer compound—"Uramite" M—designed specifically for blending into mixed fertilizers, is now being introduced commercially by the Du Pont Polychemicals Department.

"Uramite" M has such outstanding properties as high nitrogen content (38 per cent), gradual nitrogen release rate, and greatly improved safety for growing plants, according to F. M. Jornlin, sales manager.

"Manufacturers using this new source of long-feeding nitrogen in specialty mixes," he said, "can now take advantage of the same qualities that have made 'Uramite' the favored source of nitrogen on golf greens, fairways, parks, industrial grounds, athletic fields, nurseries, and greenhouses."

Mr. Jornlin pointed out that "Uramite" M, which can be used in either the dry mixing or ammoniation processes, has these advantages as an ingredient in mixed fertilizers: **1.** It provides plants—turfgrass, flowers, shrubs, and other ornamentals—with a continuous, uniform supply of nitrogen. **2.** Its high content of gradually released nitrogen offers more concentrated and safer mixtures.

## Velsicol Issues Heptachlor Data

A colorful eight-page brochure published recently by Velsicol Chemical Corporation describes the latest methods of applying fertilizer mixed with Heptachlor insecticide. Big action photos and graphic two-color drawings accompany the text. The subject is treated in an educational, rather than a commercial way, so that copies of the brochure can be used, both as an aid to farmers and as supplemental material in class rooms. Free copies of the booklet (#503-19) can be obtained on request by writing Velsicol Chemical Corporation, 330 East Grand Avenue, Chicago 11, Ill.

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**USDA predicts spectacular progress in crop chemical application by air in the next few years.**


it's... magnesia for greater yields

Year after year Berkshire's EMJEO* (80-82% Magnesium Sulphate) and Calcined Brucite (fertilizer grade) 65% MgO have proved to be invaluable primary plant foods—together with nitrogen, phosphorous, and potash.

it's... BERKSHIRE for highest quality magnesia

Be sure to include Berkshire's EMJEO and/or Calcined Brucite (fertilizer grade) 65% MgO in your mixtures as sources of available magnesium. You'll be glad you did.

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it's... BERKSHIRE'S POTNIT*

(94/95% Nitrate of Potash) for special mixtures and soluble fertilizers.

*Trademarks Reg. U.S. Pat. Off.

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# Safety...

Employees of the Smith-Douglass Wilmington, N. C., plant were recognized recently for their record as safest plant among all Smith-Douglass fertilizer plants, according to S-D Safety Director, G. T. Newnam. A barbecue dinner and safety award wallet cards were presented plant employees. A certificate of merit was presented to the plant. Above are, left to right, Clyde W. Moore, plant superintendent; Mr. Newnam; John R. Dalrymple, Wilmington plant manager; and W. P. Council, safety supervisor at Wilmington. Mr. Moore was invited to attend President Eisenhower's conference on Occupational Safety held at Washington in March.

## Coronet Wins Safety Award

The National Safety Council has announced that Coronet Phosphate Co., a division of Smith-Douglass Co., Inc., has been named first place winner for 1957 in the Safety Council's Division 4 Fertilizer Section. An award plaque will be presented the Coronet operation, near Plant City, Florida, for having achieved the best safety record among competing phosphate mines during 1957.

### NICE FRESH AIR

A prospective juryman who said he had an asthmatic condition and it might be aggravated by the courtroom air asked to be excused in Federal District Court at Jacksonville, Fla.

Judge Bryan Simpson explained the courtroom is air-conditioned, the air is filtered and it should be soothing.

"By the way," asked the judge, "where do you work?"

"In a fertilizer factory, Your Honor," the man replied.

## OLIN MATHIESON BLINDFOLDS MEN TO TEACH THE MEANING OF SAFETY

There is an old saying about the man who complained because his feet hurt until he saw a man who had no legs, or words to that general effect. There is also the classic line: "It can't happen here."

But accidents do happen here, and to people who have given no thought to the danger of the job. Not really careless people, these—just men who don't know what it means to lose an arm or a leg or an eye. In the chemical field this latter is one of the most likely accidents to be caused by carelessness. And carelessness grows apace in an area where everything looks so trim and so safe, as is true of most chemical plants.

The blinding accident is so important in the plants of Olin Mathieson's Squibb division that they recently decided to dramatize what it means to lose your eyes.

The idea really dates back to the safety director of the Army's QM Depot at Columbus, O. He was temporarily blinded, and it gave him for the first time a realization of what it meant to struggle by touch to learn how to live in the dark. Out of this grew a kit developed by National Foremen's Institute which includes such things as a blindfold, a cigarette, a toothbrush, shoe laces, a sample of Braille,—the writing for the blind. An LP phonograph record tells how to use these things in finding out what it means to be without sight. That kit is the one used at the Squibb plants, and with results they expect to be excellent.


# The proper bucket application gives you maximum cable life

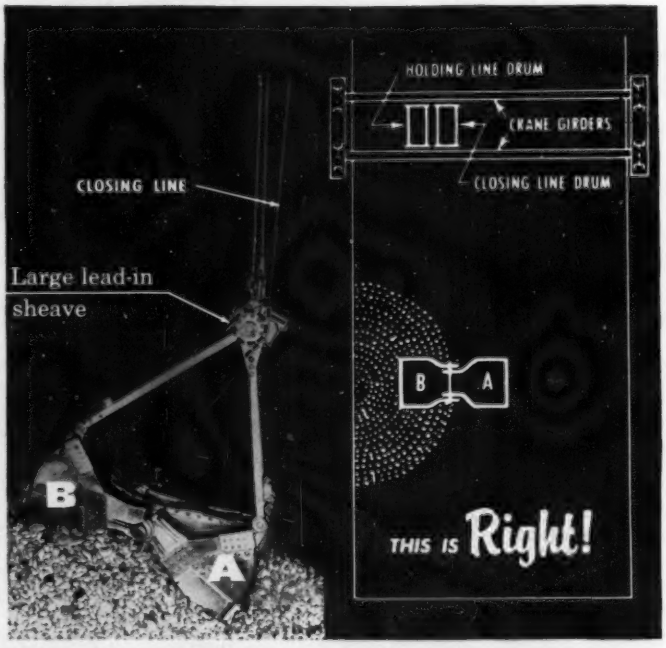
## New Blaw-Knox Booklet tells you how

Bulletin 2510 illustrates and describes in pictures and text the proper relationship between:

1. Preferred or required direction of bucket opening.
2. Location and contours of the pile of material.
3. Position of the holding and closing drums in the crane trolley.

Users report amazing increases in cable life as well as improved bucket performance as a result of applying these practical suggestions. A copy of Bulletin 2510 is yours without obligation. Write for a copy today.

**BLAW-KNOX COMPANY**
*Blaw-Knox Equipment Division*
*Pittsburgh 38, Pennsylvania*




BLAW-KNOX

# SELLING IS THE ANSWER TO ENDING RECESSION

Complete recovery from the current recession will not be possible until business and industry develop effective sales programs, Chairman Melvin H. Baker of National Gypsum Company told the Nashville Association of Life Underwriters. "Salesmanship has become almost a lost art since the end of World War II", he said. "Public savings today are at record levels; the consumer has available capital," Mr. Baker commented, "but is not buying—primarily because he is not being sold. After the war customers bought with little urging when products became available . . . there was much buying but little selling.

"This trend began to reverse itself a year ago when abnormal consumer demand ceased," he added. "For the first time in more than ten years it was necessary to sell."

Mr. Baker said that many companies and businesses have failed to develop effective programs to sell their goods and services.

"Partly because of this shortcoming," he commented, "the economic re-adjustment which began last fall has been more severe than was first anticipated.

"To a great extent, the duration and depth of this re-adjustment—now called a recession—will be determined by industry's ability to develop effective selling techniques."

Mr. Baker said the government's anti-recession moves "will only partially ease present economic strains.

"Complete recovery," he asserted, "will not be possible until consumers are persuaded to spend more money on goods and services. This will be accomplished only when the road-block of ineffective selling is eliminated by industry and business."

Chairman Baker said he was "fully confident that the art of salesmanship will be rediscovered and reapplied. . . ."

He pointed out that "when sound selling programs are instituted, consumer buying will increase and the nation will spend its way out of the recession into an age of record prosperity."

This new electromagnetic screening device claimed to handle up to five times the capacity of mechanically-activated sifters, at only one-third the power requirement, is being introduced by United Specialties Company of Illinois, division of Industrial Enterprises, Inc. Capable of making separations down to 30 microns, the NOVO screen is operated by the eight square boxes appearing above the sonic sifting surface; the boxes contain electro magnets which create a violent vibratory action on the screen mesh beneath. Through harmonics the basic oscillation of 120 cycles per second is often built up to more than 6000 cycles per second. Full information is obtainable from the manufacturer, whose address is 9705 Cottage Grove Ave., Chicago 28.

# CREDIT PROBLEM GROWS AS FARMS ADD MACHINERY

As production technology increases farmers' cash costs, credit policies become more troublesome to farm-supply cooperatives. USDA's Farmer Cooperative Service studied above-average credit operations in eight co-ops to learn what credit-control policies to recommend. The co-op study was made in Michigan, Indiana, Ohio, and Pennsylvania.

Control and collection of charge sales have become more difficult as a result of the increasing credit extended by co-ops. And farm incomes are declining, restricting the cash for increased production expenses.

To improve credit operations, FCS suggests that cooperatives: (1) Establish realistic policies by board of directors; (2) adopt specific programs for extending credit; (3) establish sound collection procedures and followthrough; (4) recognize and allocate costs of credits; (5) encourage and assist farmers to use existing credit agencies.

Average volume of the 8 cooperatives for the fiscal year 1956 was about $1⅓ million. Feed accounted for 30 percent. Proportion of feed bought rather than home grown is increasing. And advances in animal nutrition encourage purchasing antibiotics and growth regulators.

Petroleum products averaged 27 percent of the annual volume. Fertilizer accounted for 15 percent; building materials, 9 percent; farm machinery, 6 percent; seed, 5 percent; and general farm supplies accounted for the remaining 8 percent of total.

From the April issue of USDA's "Agricultural Research."

**Farm incomes will rise because farm population is dropping much faster than farm profits. Although total slipped from $12 billion to $11.5 billion in past year, per capita farm incomes grew by 10 per cent to $993. Reason: 2,000,000 persons left farms in 1957.**

## INDUSTRY CALENDAR

| Date | Organization | Place | City |
|---|---|---|---|
| May 22-23 | N.C. Soil Science | N.C. State College | Raleigh |
| June 9-11 | Sou. Fert. Control | Heart of At'l'ta Motel | Atlanta, Ga. |
| June 12 | Fert. Safety Exec. Comm. | Hotel Roanoke | Roanoke, Va. |
| June 15-18 | Nat'l Plant Food Inst. | The Greenbrier | White Sulphur |
| July 8-10 | Pac. N.W. Fert. Conf. | | Pocatello, Idaho |
| July 13-15 | Plant Food of N.C. | Cavalier | Va. Beach, Va. |
| July 18-19 | S.W. Fert. Conf. | Buccaneer Hotel | Galveston, Texas |
| Aug. 20-24 | Canadian Fert. Assn. | Manoir Richelieu | Murray Bay |
| Oct. 22-24 | Pacific N.W. Annual | | Gearhart, Ore. |
| Nov. 9-11 | Calif. Fert. Assn. | Ambassador Hotel | Los Angeles, Cal. |
| Dec. 17-18 | Beltwide Cotton Prod. | Rice Hotel | Houston, Texas |

# Pertinent Abstracts

## FROM THE RECENT MEETING OF THE AMERICAN CHEMICAL SOCIETY

### GRINDING

**Effect of Grinding on Acidulation of Phosphate Rock**

R. R. Rounsley *(Present address, Mead Corp., Chillicothe, Ohio) and* D. R. Boylan, *Chemical Engineering Department, Iowa State College, Ames, Iowa*

An investigation was undertaken to determine the effect of grinding on the acidulation of phosphate rock. Bench-scale work was carried out in a 1-quart laboratory ball mill made of stainless steel, and equipped with a heating chamber so that the material could also be dried in the mill.

The results of this work indicated that a normal superphosphate product suitable for commercial use could be obtained within an hour after addition of the first acid. The product had low moisture and low free acid contents, and under suitable conditions, granular form. The mixing action of the balls resulted in good heat transfer during drying, with little danger of overheating the product. The reaction was sufficiently rapid in the mill so that no preliminary grinding period was necessary before the drying operation was started. Low acidulation ratios resulted in low conversions as in any normal superphosphate process. Low acid concentrations were more conducive to a rapid reaction between the rock and acid. Below an acid strength of about 55%, however, there was no further advantage in dilution.

The favorable results of the bench-scale work led to the construction of a pilot plant to determine whether the process could be carried out on a larger scale and on a continuous basis. The process was built around a heated tube mill with a stainless steel lining and a feeding mechanism. Heating was indirect. The acid and rock were fed into one end of the mill and product was taken from the other.

Successful pilot plant operation showed that the bench-scale results could be duplicated on a larger scale and on a continuous or semicontinuous basis, and that the materials could be handled satisfactorily in the tube mill.

An economic comparison of the process with an equivalent standard normal superphosphate process indicated that this quick curing process was competitive if not favored. Fixed capital, production cost, and working capital were estimated to be less than for a conventional normal superphosphate process.

### PREDICTING

**Method for Predicting the Effect of Various Factors on the Liquid Phase of Granular Mixed Fertilizers**

R. S. Tinsley *and* G. R. Gilliam, *Nitrogen Division, Allied Chemical & Dye Corp., Hopewell, Va.*

With the increased demand for high-analysis materials many changes have occurred in the manufacture of mixed fertilizers. From a simple batch mixer, where essentially dry materials are blended, the fertilizer manufacturer of today is shifting to continuous granulation equipment, where highly concentrated raw materials can be utilized. Along with the use of more concentrated raw materials, problems both in processing and in obtaining the desired product quality are encountered.

Some method of predicting the effect of changes in raw materials, water content, and other factors on the product quality is needed, especially in the production of high-analysis materials. A measure of liquid phase (water plus soluble salts in solution) could be used to do this.

From an analysis of the raw materials used and the information available on the reactions that occur during ammoniation the soluble salts available in the fertilizer can be determined. On the assumption that the salts in solution during ammoniation and granulation will combine in their least soluble form, the soluble salts in the final product can be predicted. The liquid phase is then determined by holding the proper concentration of these soluble salts at constant temperature until a steady state is established, and determining the ratio of water to soluble salts. For a given grade of fertilizer, the effect of changing raw materials, water content, and other factors on product quality can be predicted by the effect of these variables on the liquid phase of the product.

Using this approach a program covering a wide range of formulations, raw materials, and grades has been carried out. An IBM electronic computer was used to aid in the rather lengthy calculations involved. Liquid phase relations of a number of complex salt systems were also determined. From this study many of the observed differences in product quality can be explained.

### REACTIONS

**Urea-Formaldehyde Reactions in the Fertilizer Industry**

James M. O'Donnell, Robert J. Cicione, *and* Fred V. Grau, *Nitroform Agricultural Chemical Co., Woonsocket, R. I.*

The combination of urea and formaldehyde under slightly acidic conditions to yield polymers of varying molecular weights for the purpose of controlled release nitrogen has been used for almost 20 years. The earliest successful use of this reaction was the combination of formaldehyde in urea-ammoniating liquors. This process technique yielded approximately one unit of insoluble urea-formaldehyde nitrogen per ton of fertilizer. The insoluble nitrogen obtained possessed good nitrifying characteristics and was relatively inexpensive.

The latest addition to this line of products has been Urea-form, the generic name applied to reaction products possessing urea-formalde-

hyde mole ratios greater than 1, high percentage of nitrogen (38%), and high percentage of insoluble nitrogen (approximately 70% of total), and exhibiting an activity index of at least 40, as recently adopted to AOAC.

Since the introduction of solid Urea-form materials to the market, the manufacturer has had three general methods by which urea-formaldehyde products could be added to mixed fertilizer goods: (1) polymerization of urea and formaldehyde within the fertilizer mix, (2) addition of a partially polymerized urea-formaldehyde emulsion to the mix, and (3) addition of a solid Urea-form in a dry blending operation.

There are at least three different processes for method 1. To date there is only one process for method 2 and this, being relatively new, is touched upon briefly. There are at least three processes for method 3. There are, therefore, seven different processes which can be used separately, or in combination with one another, to give a urea-formaldehyde mix. The products of each process possess distinctively different characteristics in regard to chemical reaction, physical properties, and eventual nitrification characteristics. A review of some of the theoretical aspects of polymer formation will greatly aid the manufacturer in his understanding of Urea-form fertilizer mixtures and eventual nitrification results he may expect.

## AMMONIATION

### Ammoniation of Nitric Acid Extracts of Rock Phosphate

J. C. Brosheer *and* F. A. Lenfesty,
*Division of Chemical Development, Tennessee Valley Authority, Wilson Dam, Ala.*

A study was made of the precipitation reactions that occur when nitric acid extracts of rock phosphate are neutralized with ammonia. Fluorine was shown to exert a marked adverse effect on the precipitation reactions by promoting the formation of apatitelike phosphates rather than dicalcium phosphate. Magnesium, iron, and aluminum had slight effects in decreasing the adverse effect of fluorine, but none of the effects were sufficient to warrant addition of these elements to the system. The only effective method of preventing the adverse effect of fluorine was to remove at least 90% of the fluorine from the system, and the fluorine was best removed by partial ammoniation of the extract and filtration of the slurry to remove the first-stage precipitate. The low-fluorine filtrate was ammoniated rapidly without formation of significant amounts of apatite, and the slurry was dried to form a highly citrate-soluble nitric phosphate. The fluorine was recovered by heating the first-stage precipitate with sulfuric acid; the phosphate in the residue could be returned to the system.

## TURF

### New Horizons for Fertilizer & Turf

Fred V. Grau & James M. O'Donnell,
*Nitroform Agricultural Chemical Co., Woonsocket, R. I.*

Fertilizer and turf are like bread and butter — each needs the other. Turf is starved for recognition by the fertilizer industry, which, in turn, can benefit by recognizing the needs of turf.

Turf is big. Careful study reveals nearly 14,000,000 acres of turf (all kinds) in the U. S., which costs $2 to $3 billion a year to maintain. Fertilizer on turf is beneficial, by increasing turf density, resistance to wear, and efficiency of water use, and reducing weed populations. Some kinds of turf use efficiently 1000 pounds of nitrogen per acre annually. A reasonable application of 100 pounds of nitrogen per acre annually (½ ton of 10-5-5) would require nearly 7,000,000 tons of 10-5-5.

This potential of fertilizer usage represents a challenge and a new horizon to the fertilizer industry. Fertilizers are needed that are tailored to the needs of turf. Urea-form fertilizers represent a new horizon to both industries. A good Urea-form can be made into a "blue chip" fertilizer (at least 50% of the nitrogen from a good Urea-form) utilizing the long-lasting, nonleaching, nonburning, no-odor, slow release features of a good Urea-form, qualities that turf long has needed.

Tests have proved the value of "blue chip" fertilizers on turf. The different ways in which these quality fertilizers nitrify and are released to the grass indicate that all existing recommendations for turf fertilizers need to be re-evaluated in the light of the new materials. This truly is a new horizon for fertilizer and for turf, both working closely together.

## CORROSION

### Corrosion of Metals by Liquid Mixed Fertilizers

J. D. Hatfield, A. V. Slack, G. L. Crow, *and* H. B. Shaffer, Jr., *Tennessee Valley Authority, Wilson Dam, Ala.*

The corrosive effect of liquid mixed fertilizers on mild steel, stainless steel, and aluminum alloys was determined. Significant variables and interactions between them were identified and, in the case of aluminum, an equation developed whereby corrosion rates can be estimated for any combination of variables within the ranges tested.

Aluminum was found to be in a marginal category in regard to usability. Under certain combinations of variables alloy specimens showed satisfactory resistance, but under others only fair or slight resistance. Conditions which had a significantly adverse effect were high phosphate content, high temperature, and aeration of sample. Beneficial conditions were presence of potash and use of inhibitor. Variables such as $NH_3$: $H_3PO_4$ ratio, pH of solution, use of urea versus ammonium nitrate, and welding had no significant effect in the ranges studied.

There were some differences in resistivity of the aluminum alloys tested, but the effects of solution variables were much more important. Use of an inhibitor reduced corrosion to the point that a satisfactorily low overall corrosion rate was indicated for all solution conditions tested. Some pitting was observed, mainly on welded samples. Pitting at the liquid line and in the vapor zone was not tested in the present study; work by others indicates that under some conditions this would be an important consideration.

Both mild steel and stainless steel were either fully or satisfactorily resistant under all combinations of variables tested. The variables had about the same significance and quantitative effect as for aluminum but in view of the generally low level of corrosion, the effects are of little practical significance. As in the case of aluminum, work by others on mild steel has shown that pitting of tanks in the vapor zone may be a significant factor.

**These ACS topics presented at the Food and Agricultural Chemical Section of the American Chemical Society meeting in New York, fall 1957.**

## PILOT-PLANT

### Pilot-plant Production of Ammonium Phosphate-Nitrate Fertilizers

M. R. Siegel, R. S. Meline, *and* T. M. Kelso, *Tennessee Valley Authority, Wilson Dam, Ala.*

Homogeneous, granular, high-analysis fertilizers containing ammonium nitrate and ammonium phosphate were made by combining electric-furnace or wet-process phosphoric acid with ammonia - ammonium nitrate solutions. After exploratory studies of several methods and types of equipment, a process using a rotary cylindrical ammoniator for carrying out the reaction and granulation simultaneously was selected for development on a pilot-plant scale. The mixtures granulated well and formed round, hard granules. The granules were dried, cooled, and screened. Potassium salts were incorporated in the product by feeding potassium chloride or potassium sulfate to the ammoniator. Typical grades of the fertilizer products, called ammonium phosphate-nitrates, were 11-22-22, 16-22-16, 17-17-17, 8-16-36, and 16-48-0. High-nitrogen grades such as 28-14-0 and 30-10-0 also were made by adding additional nitrogen as solid ammonium nitrate. Many fertilizer plants that have a continuous ammoniator can be converted readily to the production of ammonium phosphate-nitrate.

## AMMONIATOR

### Pilot-plant Production of Nitric Phosphate Fertilizers using the TVA Continuous Ammoniator

T. P. Hignett, M. R. Siegel, David McKnight, *and* F. P. Achorn, *Tennessee Valley Authority, Wilson Dam, Ala.*

A new process for producing nitric phosphate fertilizers involving simultaneous ammoniation and granulation was developed in the pilot plant. Phosphate rock was extracted with nitric acid with or without addition of sulfuric or phosphoric acid. The slurry from the extraction step was processed in the TVA continuous ammoniator, where it was mixed with other fertilizer materials and recycled fines, ammoniated, and granulated. The granules were dried, cooled, and screened to yield a minus 6l plus 10-mesh product. Oversize and undersize were recycled. Grades produced in the pilot plant included 12-12-12, 14-14-14, 10-20-15, and 10-15-20. The versatility of the method was demonstrated further by the successful use of several formulations for 14-14-14.

The present process requires less investment and is more versatile than nitric phosphate processes in which the ammoniation step is carried out in a fluid state and granulation is a separate step. It is believed that the present process may be carried out in some conventional fertilizer granulation plants by the addition of a relatively inexpensive extraction unit and other minor changes. The same equipment could then be used alternately for producing nitric phosphate fertilizers and conventional fertilizers. This would be desirable because the nitric phosphate process may be the cheapest method of making high-nitrogen grades in some locations, but it is not readily adaptable to the manufacture of low-nitrogen grades.

## N-LOSS

### Apparent Loss of Organic Nitrogen in Fertilizers Containing Urea and Natural Organics

Charles E. Waters *and* Robert G. Ziegler, *Nitrogen Division, Allied Chemical & Dye Corp., Hopewell, Va.*

Some special purpose fertilizers are made with activated sewage sludge or tankage, together with urea, and thus contain both insoluble and soluble organic nitrogen. When one company making such fertilizers repeatedly came up with a fraction of a unit less organic nitrogen than expected, the reason was sought.

The question was whether the trouble was caused by a flaw in the analyses, or by actual hydrolysis of urea or the natural organic in the mixing process. It was even suggested that an enzyme in the sludge or tankage might be decomposing urea. To test these points, analyses were run on simulated fertilizers, mixtures of preammoniated superphosphate and two different natural organics with and without urea, and laboratory-made 8-6-4 and 10-6-4 fertilizers.

It was concluded that there is often an apparent loss of organic nitrogen, because of high values for ammoniacal nitrogen. The high values are due mainly to partial hydrolysis of urea in the determination, even in distillation from a slurry of magnesium oxide. This error can be minimized by limiting the amount of distillate to 100 ml. as specified. The natural organics also contribute slightly to the apparent ammoniacal nitrogen. Actual conversion of urea nitrogen to ammoniacal nitrogen was estimated to amount to no more than 0.1%, based on the whole fertilizer, except with prolonged heating. In fertilizers kept at 50°C. for 5 weeks, the conversion of urea nitrogen to the ammoniacal form amounted to 0.3 to 0.4%. There was no evidence that either of the natural organics had any effect upon urea.

## CAKING

### Microscopic Study of the Mechanism of Caking and its Prevention in some Granular Fertilizers

Julius Silverberg, James R. Lehr, *and* George Hoffmeister, Jr., *Tennessee Valley Authority, Wilson Dam, Ala.*

Microscopic studies of several types of high-analysis granular fertilizers showed that caking resulted from bonding of granules by crystals of soluble salts that formed veneers or hulls on the surface of the granules during storage. Compositions of the salts depended on the formulation used in making the fertilizer; among the bonding phases identified were potassium nitrate, ammonium chloride, monoammonium phosphate, ammonium nitrate, and a urea-ammonium chloride complex.

Decreasing the moisture content of the granular fertilizers decreased the reaction and recrystallization of fertilizer components during storage, with the result that the crystalline hulls that formed were thinner and denser, and caking was reduced or avoided. Pile curing of products prior to bagging accelerated the reaction and recrystallization processes, so that formation of hulls was well advanced at the end of the curing period and caking in subsequent bag storage was reduced or avoided. Coating granular fertilizers with a conditioner such as kaolin or kieselguhr prior to bagging reduced or prevented caking by promoting the formation of finer, more densely packed surface crystals and reducing formation of crystals at contact points. The surface hulls on conditioned granules formed almost entirely below the coating agent.

## DECOMPOSITION

### Thermal Decomposition of Ammonium Nitrate in Mixed Plant Food

Walter Drobot, *Plant Food Division, Research Laboratory, Swift & Co., Calumet City, Ill.*

Commercial mixing of grade 12-12-12 plant food using nitrogen solution showed evidence of a self-sus-

tained, exothermic decomposition of ammonium nitrate, which continued after the mixing operation was completed. The ammonium nitrate was completely decomposed and the temperature of the product exceeded 500° F.

Differential thermal analyses of various mixed plant foods containing ammonium nitrate showed that fertilizer salts promote the rapid decomposition of this material. A slow breakdown started at a temperature of 410° F. At nitrate-nitrogen concentrations between 1.0 and 2.8%, a rapid, complete decomposition began at a temperature of 440° F. Partially decomposed ammonium nitrate in plant food mixtures could be completely broken down by reheating.

Initiation temperatures determined by the thermal test method were essentially reproducible.

The need for adequate control of plant food mixing operations involving ammonium nitrate was indicated in order to prevent the decomposition of this material in product storage piles.

## Ott Makes Movie For Standard Oil (Ind.)

A kernel of corn sprouts and grows to a full-sized stalk in a matter of minutes in an unusual educational color motion picture just released to show the value of nitrogen for good plant growth.

Produced by Standard Oil Company (Indiana) and filmed by John Ott, specialist in time-lapse photography, the 25-minute non-commercial film, with sound narration, is called "Nature's Need for Nitrogen." It is available to farm and agricultural organizations and other interested groups.

Specialized techniques show in the film actual bacterial decomposition of corn stalks underground, an organic process that helps replace soil nitrogen. A corn crop of 60 bushels an acre removes 95 pounds of nitrogen from an acre of soil, the film points out.

In photographing the time-lapse sequences, Mr. Ott rigs a motion picture camera to make individual exposures at regular intervals that can be varied from every 10 seconds to 90 minutes. As a plant grows, the camera shifts position. When the exposures are completed and the film shown at normal speed, it is possible in a few minutes to watch the growth of a cornstalk that actually has taken four months.

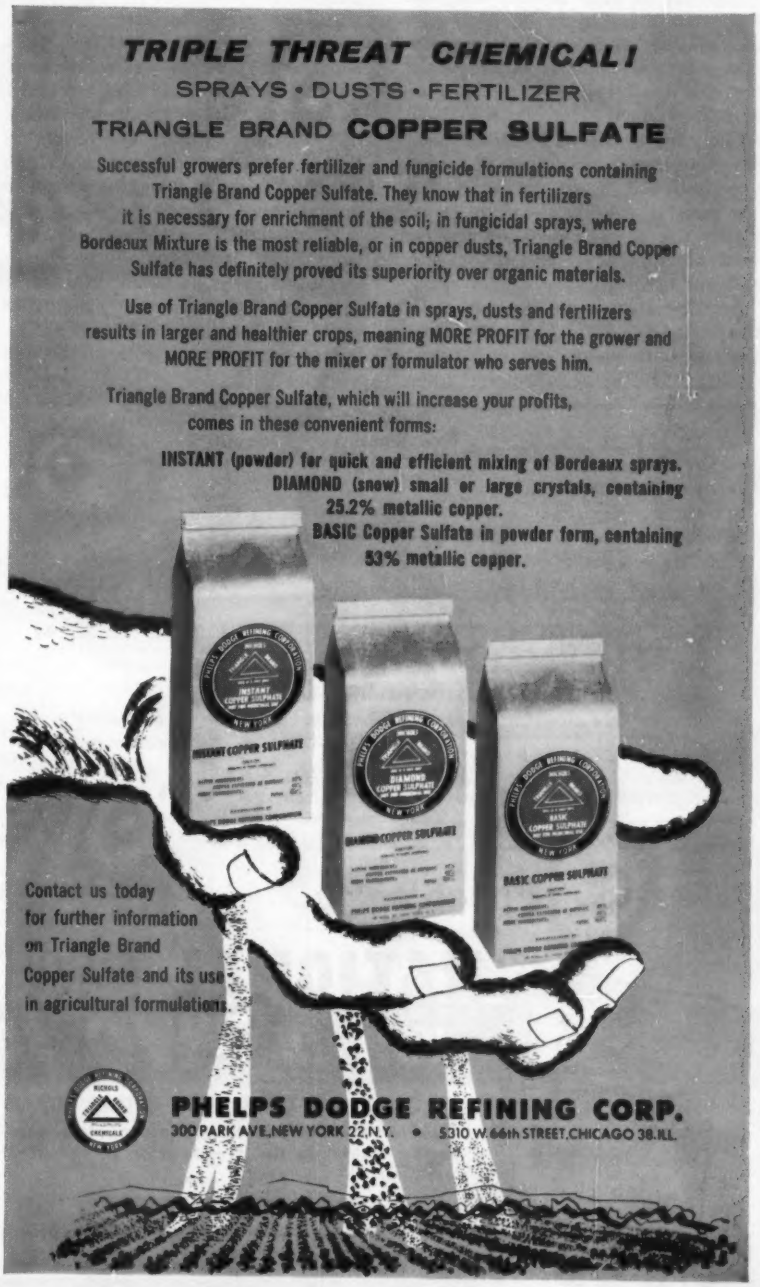
The film was produced to demonstrate the basic nitrogen need of farm crops and other plants. It emphasizes that other types of fertilizers also are required, but stresses anhydrous ammonia as a method to replenish nitrogen-deficient soil.

Part of the film compares the growth and characteristics of two corn stalks—one with the proper nitrogen supply and the other with nitrogen deficiency. The corn kernels are shown sprouting, the sprouts pushing through the soil, and finally the stalk developing to maturity, bearing ears of corn.

C. J. Struble, Standard Oil Nitrogen Products Department manager at Chicago, inspired the idea for the motion picture after seeing time-lapse films made by Ott (who appeared at NPFI's annual convention two years ago).

It took nearly two years to complete the finished film. Working with Ott as technical advisors were Ernest Herrbach, entomologist, and Leonard L. Schrader, agronomist, of Standard. Scientists from the agronomy and soils departments at the universities of Wisconsin, Illinois, and Indiana also assisted in the production, verifying technical details.

The film can be booked in the Midwest through the Nitrogen Products Department of Standard Oil Company, 910 S. Michigan Avenue, Chicago 5, Ill.

# FERTILIZERS AND *Farm Income*

*by* Dr. Vincent Sauchelli
*Chemical Technologist*
*National Plant Food Institute*

To use fertilizer is to make money. That is one conclusion that can be drawn from the recent NPFI study* of farmers' attitudes toward the use of fertilizer. It deserves to be emphasized by dealer, salesman and all educational agencies. **Fertilizer means profit to the farmer.**

The Analytic Report shows clearly that a high level usage of fertilizer pays off. For example, in 1956 the average gross income per acre for farmers operating 100 acres or more, regardless of crop grown, was $46. For high level users of fertilizers, the average gross income was $66. Non-users of commercial fertilizer had the relatively low gross income of $37. Thus the farmer who used a fairly high level of fertilizer made $29. more per acre than the non-user and $20. more per acre than the general average. (High level means use is close to standard for most economical operation for crop and soil involved.)

Fertilizers are economic commodities in today's farm business. They increase both yields and nutritional quality. Business farmers have learned how to estimate the expectable gains in yield from various rates of fertilizer applications. They also can easily calculate the actual cost of materials and labor involved in a specific application of fertilizer. Furthermore, in the case of most crops it is generally possible to estimate weeks in advance the minimum price they will bring in the market place. Thus, the profitability of the fertilizer can be estimated as the difference between the input cost and the market return of the crop. This difference can be assessed on a cash-per-acre basis or as a percentage of the fertilizer cost.

In the large majority of farm crops the financial returns on such short-term investments represented by the fertilizer cost can rarely be matched by other forms of investment. Many bankers are becoming aware of this fact and are now more disposed to make loans for fertilizer purchases.

When farmers cut down on fertilizer usage from previous levels, as is reported being done at present in some parts of the country, they lose considerably more farm income than the money they save from the reduction.

**TABLE 1**

| | Group 1 | Group 2 | Group 3 |
|---|---|---|---|
| Number of farms | 12 | 11 | 12 |
| Average expenditure on fertilizer per acre | 29s 10d | 19s 2d | 8s 0d |
| Fodder—producing acreage per cow | 3.02 | 3.06 | 3.01 |
| Av. milk yield per cow (gal.) | 671 | 641 | 542 |
| Av. milk yield per acre (gal.) | 222 | 209 | 180 |
| Value of milk per acre calculated at pool Prices, 1942-47 | b28 13s 6d | b26 19s 11d | b23 5s 0d |

**TABLE 2**
**Reduce Unit Cost—Increase Profits**

| | Fertilizer Average Used | Fertilizer Recommended |
|---|---|---|
| Yield per acre | 40 bu. | 65 bu. |
| Corn price | $ 1.40 | $ 1.40 |
| Income | $56.00 | $91.00 |
| Cost per acre | 39.00 | 55.00 |
| **Profit** per acre | $17.00 | $36.00 |

These use and profit relationships are brought out strikingly by the following data from Great Britain and our own country.

British records published in World Crops (October 1953), and given by the Farm Economics Branch of the University of Durham, tell a convincing story in the following summary representing a 5-year survey:

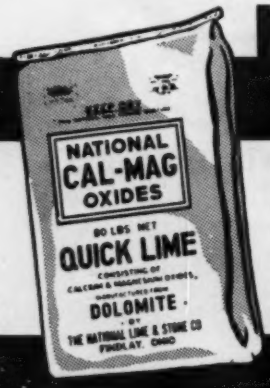
Sir James Scott Watson, a British authority said in a recent speech: "The evidence from plot experiments is borne out by the findings of farm management economists. To take but one example, the farmers of the six most profitable holdings, in one particular group, spent 49 shillings per acre on fertilizers; those of the six least profitable holdings spent only 17 shillings . . . One fact is that large farmers, on the average, use more fertilizers than small farmers; expenditures on fertilizers, as a proportion of total outgoings, is about twice as high on the over-500-acres farms as on the under-50-acre group."

A typical record from this country showing a similar use and profit relationship is this from the Missouri Agricultural Experiment Station studies. By using the amount of fertilizer recommended by the Missouri AES as contrasted with the average used at the time, a high level fertilizer farmer could expect to profit as shown:

The difference between market returns and production costs is the decisive factor in profits. A farmer may increase production costs, that is, use more fertilizer; but, if he gets more return per acre than if he did not, that increase is justified. So, you see, cutting down the total expenses may do more harm than not. Important idea is to increase output per unit (cow, beef, acre, and so) which in turn reduces crop unit cost per acre.

All this is another way of saying: To use fertilizer is to make money.

* National Analysts: A survey, released by National Plant Food Institute, 1958.

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